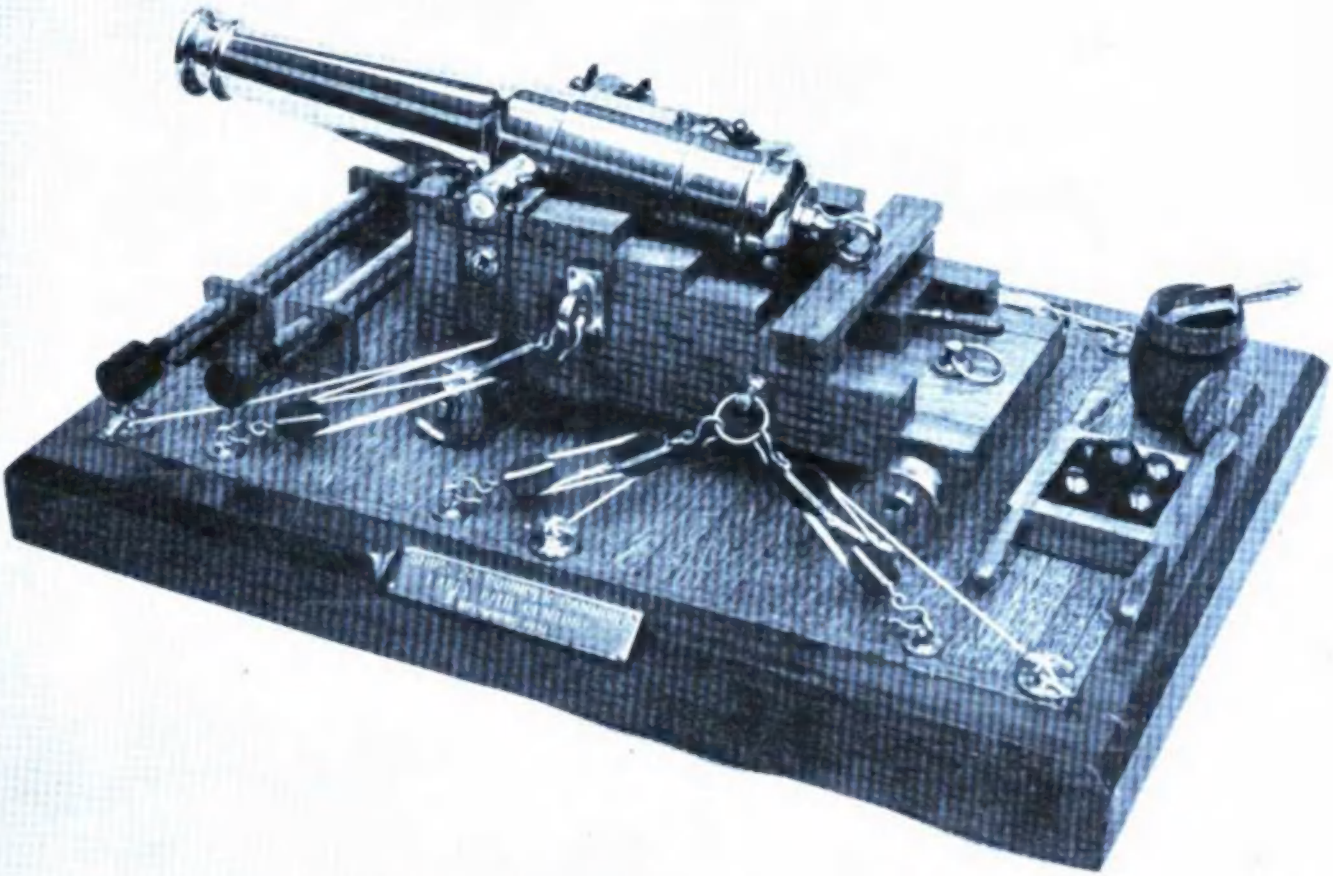
THE MODEL ENGINEER



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THE MODEL ENGINEER

EVERY THURSDAY

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Our Cover Picture

This photograph is of a fine model of an old ship's 24-pounder gun of the early nineteenth century, which was made by Mr. N. Downing, of Timperley, and was shown at the recent exhibition of the Northern Models Association of Model Engineers in Manchester. Such a model indicates an all-round interest in model making, calling as it does for skill in research, woodworking, metalworking and even in rigging. The powder barrel, with its lid and scoop, was a dainty piece of work. The tray for carrying shot, and the rammers and swabs for loading and cleaning the gun after firing, were also included. In similar models we have seen, a section of the side of the ship with the gunport has been included, and this enables the gun tackles and breeching ropes to be shown in their correct position. Historically, perhaps, this is the better scheme, but as an ornament, the model as here shown is more effective.

SMOKE RINGS

A National Memorial

MOST MODEL engineers are interested in ship models, and undoubtedly one of the most popular ships, as a prototype for a model, is the *Cutty Sark*. On April 20th a world-wide movement was officially started to raise a sum of money to preserve the ship. The scheme is to have the ship in a dry dock, which is to be built near the Greenwich Pier and the National Maritime Museum. She will be raised so that a fine view of her will be seen by anyone passing on the river, and the public will be permitted to go on board. The interior will be arranged as a maritime museum, and a prominent feature of the exhibits will be the famous collection of figureheads and relics which has been generously donated by Captain Long John Silver.

We, as a nation, are fortunate in having the *Cutty Sark* to preserve, as she was considered by many to be the finest and fastest of the clipper ships, and the clipper ships showed the finest development of the sailing ship, at least as regards speed.

H.R.H. The Duke of Edinburgh, is the patron of the scheme, and many influential people and bodies are interested in it. But, after all, the appeal is to *all* people throughout the world, and *all* contributions, great or small, will be welcomed. Donations and enquiries should be addressed to The *Cutty Sark* Preservation Society, Palmerston House, 51, Bishopsgate, London, E.C.2. Telephone: London Wall 3727. Donation and deed of covenant forms will be supplied on request.

A New Opposed-piston Engine

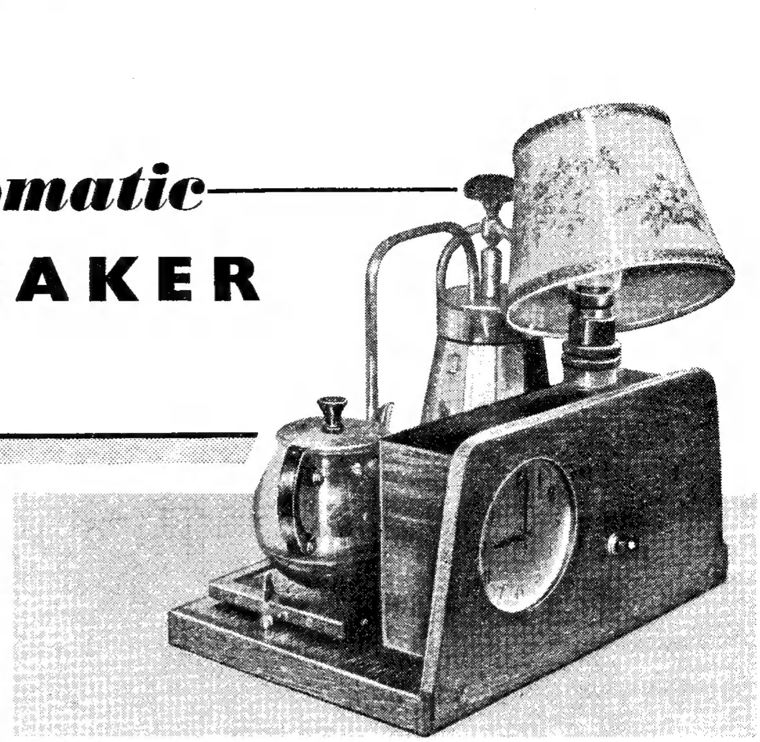
THE OTHER day we were invited to see "The Deltic," a new type of diesel engine which has been built for the Admiralty by Messrs. D. Napier & Son Ltd., the famous London engineers. This is a two-stroke engine of the opposed-piston type, having six banks of three cylinders each, the cylinders being arranged in the form of an equilateral triangle with a crankshaft at each corner, hence its name "Deltic." When one sees the engine, one wonders why the arrangement was never thought of before—which is usually the hallmark of a sound idea. The crankshafts are geared to a gearbox on the end of the engine which has a central output shaft. With a bore and stroke of $5\frac{1}{8}$ in. × $7\frac{1}{4}$ in., the engine develops a maximum horsepower of 2,500 at 2,000 r.p.m., and the fuel consumption is economical. None of the parts is highly stressed and, being a two-stroke, the maintenance costs should be very small, especially as the engine is built of interchangeable units. It is an ideal engine for marine work, as it is compact and of reasonable weight. The running costs will be very light, the upkeep will be easy, and being of comparatively light weight and small dimensions for its power, it forms an attractive proposition for even a cargo ship. At present two of the engines are installed in H.M. Fast Patrol Boat 5212, an *ex*-German E-boat, which we were permitted to see in operation, one of our staff being on board and the other in an accompanying speed boat taking photographs. The performance was most spectacular. A detailed description of this engine will be given in an early issue.

To Traction Engine Enthusiasts

WE HAVE received a request from Mr. John J. Menchhofer, The Pioneer Engineers Club of Indiana, 3520, West 12th Street, Indianapolis, Indiana, U.S.A., asking us to advise traction engine enthusiasts in Britain that he would like to correspond with them. We are pleased to publish this request, because we know that many of our American friends are as interested as we are in the old steam road locomotives, and we hope that Mr. Menchhofer's request will not pass unnoticed.

an automatic TEA-MAKER

By D. Webb



THIS machine does not call for any "precision" model engineering. No lathe is essential for the making of any of the parts. It is merely something which is useful and interesting to make; something which, in the writer's case at any rate, he could not afford to buy.

The machine is designed to switch on the power to the electric boiler element at a pre-set time, to pour the boiling water into the teapot and to sound a buzzer and turn on the light 3 to 5 minutes after the tea has drawn, when it is ready for pouring out.

It is based on the well-known "rocking platform" principle, in which the weight of the water when cold keeps the platform down at the boiler end until such time as the steam pressure in the boiler forces the boiling water up the tube and into the teapot, when the weight of the water thus transferred to the other end of the platform causes the platform to tilt, and in doing so, to switch off the current to the boiler element.

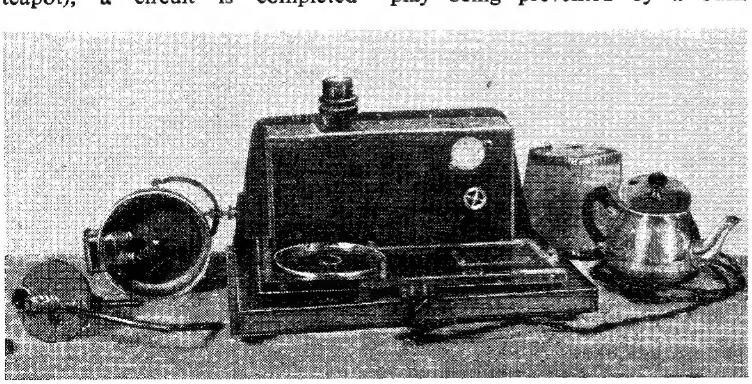
As the platform descends, a further set of contacts is completed and passes the mains current to a thermostat, situated underneath the teapot, and when the contacts of the thermostat have closed (due to heat conducted from the base of the teapot), a circuit is completed through a lamp and buzzer, which light up and sound respectively, and one is awakened to find one's tea made, and ready for pouring out. As the machine will invariably be used at the bedside, a refinement has been added by way of a small dial illuminating bulb.

The Clock

This is a synchronous electric clock movement of the standard type, with two minor modifications. Some form of electric switch (capable of safely handling the 2 amps current of the boiler element) has to be incorporated, and it was decided that a mercury type of switch was the easiest to fit, and fulfilled the safety requirements. The movement is dismantled and a lever is fitted over the movement pillar nearest the top of the plates, side play being prevented by a bush extending the full length of the pillar, yet leaving the lever the essential free movement of a few degrees necessary to tilt the glass tube containing the mercury. At the top end of the lever, a bracket is fitted and the round body of the mercury switch is clamped to it by means of a piece of sheet metal, the glass being protected by having a few turns of Empire tape wrapped around it. The bottom end of the lever has riveted to it a pin which rides on the periphery of a disc of brass force fitted to the hour wheel of the clock—the wheel which carries the hour hand. A notch is filed in this disc which permits the pin to fall into it at the chosen time, thus tilting the lever and mercury switch and turning on the current to the boiler. A slow rise out of the notch is provided to enable the pin to ride back on to the periphery of the disc with as little retarding action on the clock movement as possible.

In the clock I have used, as the "motion work" (the 12 to 1 reduction gearing for the hands) is within the clock plates, the disc fits neatly between the back of the dial and the front plate of the movement, the lever being inside the movement, and the pin operating through a curved slot cut for the purpose in the frontplate.

When the pin is riding on the plain circumference of the wheel, the switch should be arranged so that the mercury in it is resting in a pool at the plain glass end of the tube and with the circuit therefore



Rear view with boiler and teapot removed

broken. When the pin drops into the notch, the movement of the lever should be such that the mercury travels up to the opposite end of the tube, over the contacts and completing the circuit. Both these movements can be controlled by means of back stops, the actual depth of the notch being unimportant.

In the final fitting up, the hand-setter should be turned gently until the pin falls into the notch and the hands then fitted about a quarter of an hour in advance of the time at which one desires to be awakened, this quarter of an hour being taken up by the time taken to boil the water and for the tea to draw.

It is appreciated that, in using an ordinary clock movement as a time switch, no simple provision can be made for altering the time at which the action is to take place. However, it is felt that most people arise at the same time each morning and for, say, Sunday mornings, when the tea and call may be required an hour later, then the clock may be set that amount slow. To facilitate this, the normal hand-setter has been replaced with a wheel type, to enable it to be quickly set and reset back to normal by a finger-tip action from the front of the machine.

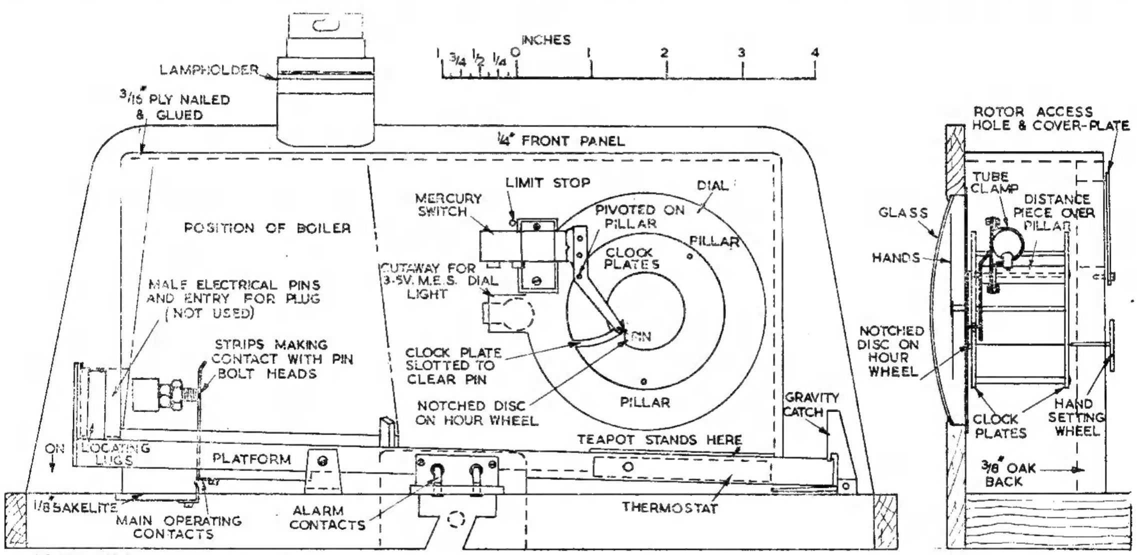
If no electric clock movement is available, a standard clockwork alarm clock could be modified by arranging the alarm side winding key to tilt the mercury switch, and silencing the alarm by removal of the hammer.

The second modification to the clock is optional. It was considered that, as a bedside fitting, the dial should be illuminated and this has been done by means of a 3.5 V M.E.S. bulb fitted at one side of the dial in a recess cut for it at the rear of the front panel. A 2-volt supply to a 3.5 V bulb was found sufficient for a night illuminant at close quarters, and 200 turns of 26 g. enamel wire, overwound on the main clock coil provided the voltage required.

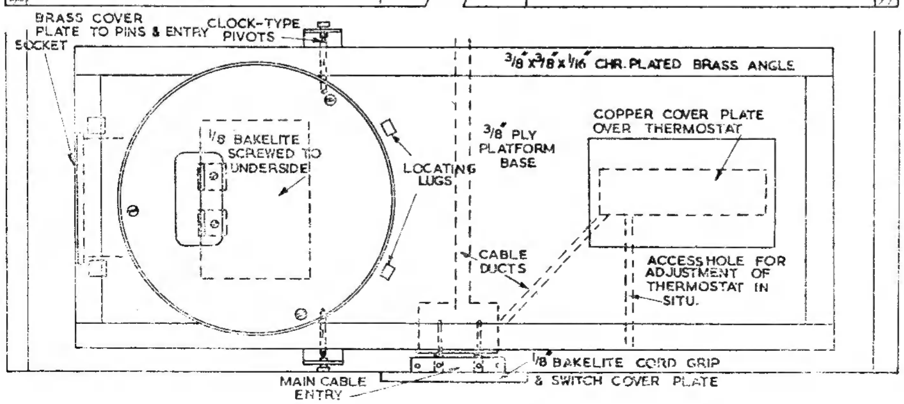
The Boiler

My own boiler is not, as far as I know, obtainable on the market but hospital suppliers could be tried. It is a hospital portable steriliser, electrically heated and with a screw-down pressure lid, ideal for the job. However, any totally enclosed electrically heated container could be used and a neat, square and rather more squat type could easily be made from copper sheet and an element fitted under it. If thus made a pressure lid need not be made, but a steam-tight plug would have to be fitted, for filling purposes, in its place.

A piece of ¼-in. o.d. copper or brass tube is fitted through the top of the lid to within a quarter of an inch of the base of the boiler, the pressure of steam (a very slight pressure of a few "inches of water") forcing the water up the tube and



Above — Rear and end elevations



Left—Plan of base and platform

down into the teapot. As this pipe is always open at both ends, no safety valve was considered necessary.

To ensure that the water is boiling vigorously before this action takes place and to prevent merely warm water expanding up the tube and into the teapot, a 2-B.A. bolt is fitted through the top of the boiler, in which a No. 60 hole is through-drilled. When the water first boils, steam and water will prime out of this small hole, sufficient to spoil polished woodwork, and it is essential that the outlet of this No. 60 hole is directed downwards by means of the piece of curved $\frac{1}{8}$-in. o.d. pipe, and the whole enclosed in a small "pot" with a vented lid.

The Platform

This consists basically of a piece of $\frac{3}{8}$ in. thick plywood which is surrounded by $\frac{3}{8}$ in. $\times$ $\frac{3}{8}$ in. $\times$ $\frac{1}{16}$ in. chromium plated brass angle, to improve the appearance and to give rigidity. It is pivoted by means of two alarm-clock balance wheel pins working in their associated hollow conical screws which latter are mounted on the baseboard. These pins are a force fit into the brass angle and are further supported by the wood of the platform. *The point of balance is decided when the platform is completed and the boiler and teapot to be used are available.* Place both, empty, on the platform and ascertain the point of balance on a rule; mark the place and fit the pins at the same point. The weight of the water placed in the boiler will then keep the platform down at that end until boiling takes place and twice the weight of the water transferred to the teapot will be available as the operating mass.

Under the platform at the boiler end is a piece of $\frac{1}{8}$-in. bakelite on which the two upstanding boiler contact strips are mounted. The top end of these strips make contact with the element terminals under the boiler, and the bottom end of the strips contact two mating strips mounted proud on the baseboard of the machine. When the platform tilts, therefore, these contacts virtually act as a double pole main switch and cut off the current to the boiler. One eighth of an inch of movement of the platform, measured at the contact point, is sufficient.

When the teapot is removed for pouring, the platform tends to tilt back and restore the circuit. To obviate this, a gravity catch is provided. The catch should be carefully made and foolproof in action as, with a synchronous clock, the machine as a whole cannot be disconnected from the mains supply at any time and the platform must be made to remain down at the teapot end so that the boiler circuit is not again completed 12 hours after the switch operates in the morning. Also, when the boiler is removed for refilling, if the platform were down at the boiler end, the upstanding contact strips could be alive.

At the rear edge of the platform, two further contacts are provided, mating with a similar pair on the baseboard, to convey the current (through the bulb and buzzer) to the thermostat which is positioned in a hole cut for it in the platform base and with a copper plate over for the teapot to stand on. The thermostat is provided with an adjusting screw and a hole is drilled opposite this screw, right out to the rear edge of the platform to enable a long, thin screwdriver to be inserted to make the setting-up adjustments in the number of minutes' delay between the boiling water entering the pot and the thermostat contacts closing, i.e., the drawing time. It will probably be found necessary to reverse the action of the thermostat as bought, since these usually break contact on a rise in temperature and the opposite is required here. Remove the bi-metal strip, crank it in the opposite direction and replace, checking that the contact screws still make good contact. A 750 V 0.02 mfd capacitor is wired across the platform contacts of this part of the circuit to discourage arcing.

The fitting of the thermostat is an optional refinement. If it is not required, the thermostat may be omitted and the platform contacts short-circuited; the buzzer and light will then operate immediately the platform tilts.

The teapot must be of metal construction with a flat base to ensure good conduction of the heat to the thermostat. Even if the thermostat is not used, a china pot would be unsuitable, as these require pre-heating.

The cover at the rear of the main front panel contains the clock and switch already described, the buzzer and light with its associated standard

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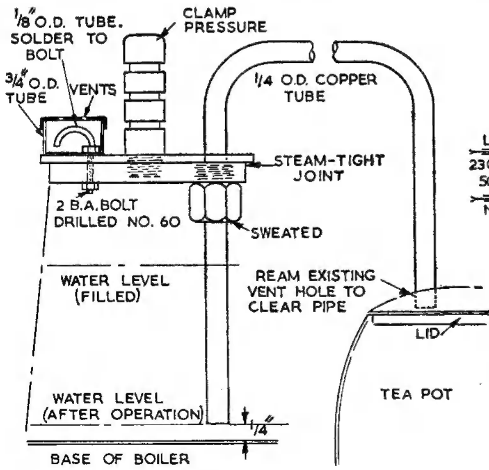
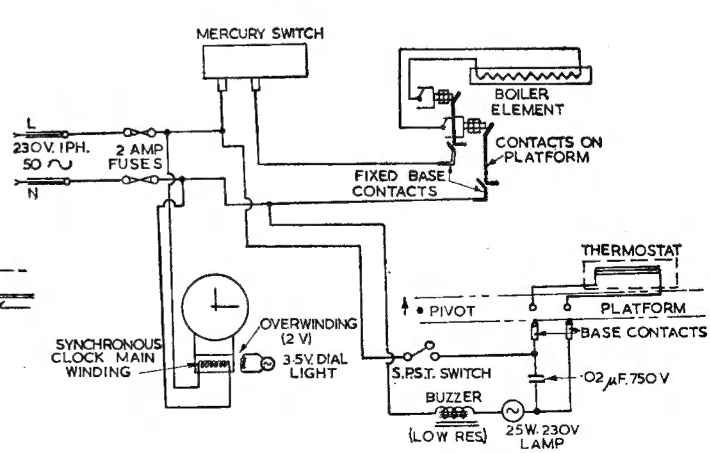


Boiler plumbing details



Wiring diagram

Repairing a Drawing Pen

By H. H. NICHOLLS

A FRIEND asked the writer if anything could be done, to repair a draughtsman's pen of good Continental make, from which the handle (made of some black plastic material) had broken off when the instrument was accidentally dropped.

Referring to the illustration Fig 1, we have the body of the pen at *A*, and a screw thread *B* formed upon it.

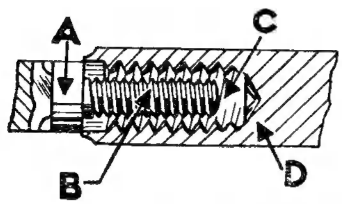


Fig. 1. Fixing new handle to a draughtsman's pen

This screw thread was apparently cut by some odd screw plate, and matching it, even in the metric series of threads, proved impossible, and there was not enough metal to cut a new B.A. thread.

The solution to this problem came in the form of a peculiar low melting-point alloy, which expands when it solidifies, and melts at the extremely moderate temperature of 70 deg. C., known as "Cerrobend," made by the firm of Mining and Chemical Products Ltd., 376, Strand, London, W.C.2.

I made a handle from duralumin rod, and drilled and tapped it at one end, with a Whitworth thread, which gave a good space *C* between the odd thread *B* and the material of the handle *D*. This space *C* was then filled with the alloy, the degree of heat wanted being low enough to avoid any danger of spoiling the polished body of the pen, *A*.

A small fragment of the "Cerrobend" alloy was placed in the tapped hole, and the slightly heated pen carefully introduced, the surplus alloy being squeezed out, the job being perfectly firm when it had become cold, no "flux" of any kind being used in the operations.

The manufacturers of the material point out, that there is no "tinning" effect, the bond is occasioned purely by the swelling of the alloy.

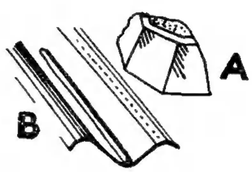


Fig. 2. "Cerrobend" in lump form and cast into a stick

A small quantity of the alloy is bought as a lump, like *A* in Fig. 2; to prepare it for delicate tasks as described, one must melt it very carefully, and pour it into the stick form as shown at *B*, by means of a piece of curved tile or corrugated metal (coating the latter, if used, with blacklead to prevent any chance of the alloy sticking), then one has the alloy in a handy form, with which cavities in patterns, holes in the surface of a casting, etc., can be filled up, provided always that the articles are not subjected to any undue stress or heat. In the case of the draughtsman's pen described, an article, of which the working part was perfectly serviceable, was restored to use at a fraction of the cost of a new pen, and in much less than the time required to send it away to have some other kind of handle fixed to it. It is evident that an interesting and valuable material is to be had in this alloy. In another case, I found that a firm fixing could be made in plastic material, as the warmth required was not sufficient to scorch or discolour the article being operated on. In case the alloy should be wanted quickly, without using any special appliances, one may melt it in a glass jar surrounded by boiling water, its melting point of 70 deg. C. being, of course, 30 deg. less than the temperature of the boiling water, this treatment obviates any risk of burning, or discolouring the alloy by too much heating.

An Automatic-Tea Maker

(*Continued from previous page*)

B.C. lampholder, shade and on-off switch mounted on the front panel. It will be appreciated that the light is not intended as a general bedside lamp controlled by the switch shown, but only comes into operation with the buzzer, and both are turned off by the switch after waking and when the normal room lighting has been restored.

The buzzer consists of almost any type of low resistance ex-Service relay, the type having a heavy armature being the most suitable as it makes the most noise. Also note that the buzzer is wired *in series* with the lamp, the current taken by the lamp being sufficient in flowing through the low resistance windings to work it. As the buzzer is only operating for a few seconds, it is not necessary that it should be of laminated construction. As a guide, a relay of about 30 ohms resistance should be chosen, a higher resistance giving a dimmer light. The armature of the relay must be fitted with a light piece of spring, set to hold it away from the pole faces.

The cover has a 1 in. dia. hole cut in it for starting the clock rotor, and a plate fitted over it.

The baseboard consists of a piece of $\frac{3}{4}$-in. blockboard, veneered one side and lipped at the edges with solid stuff. The front panel is $\frac{1}{4}$ in. or $\frac{3}{8}$ in. thick solid oak and the whole is french polished. The underside of the baseboard is channelled out for the various leads, and these are taken to the bakelite distribution board, where all connections are tied and soldered.

Where a 3-pin outlet is available in the room in which the machine is to be used, all the exposed metal work should be bonded and taken to the earth pin through a third lead.

The items were obtained from the following sources:—mercury switch, Smith's Radio Stores, Lisle St., London, W.C.1; thermostat, Technical Services Co., Shrubland Works, Banstead, Surrey (as recently advertised in THE MODEL ENGINEER); tea pot, Swan brand "Carlton" 2 cup size, No. 660.

L.B.S.C.'s Lobby Chat

● CONTROLLED FIRING

AN older reader of these notes had a spot of bother with a recently-completed 2½-in. gauge locomotive which others have also encountered; so let's sit down around the old lobby stove, pass the tea-bottle around, and sort matters out. The engine is a copy of one of the old London and North Western 4-6-0 *Prince of Wales* class, and she steams and pulls in the manner usually observed among her full-sized relations; but she also has another of their characteristics, inasmuch as she "talks to the sky" and distributes a shower of incendiary bombettes when hauling a big load. This is, of course, only natural when working hard; on 2½-in. gauge, even one normal adult is equal to a full-size load of 27 coaches, and concentrated on four axles, at that. The trouble arises when the smokebox ash piles up nearly to the top of the blastpipe, and the lower row of tubes becomes completely choked at the firebox end. A "bird's nest" usually forms around the return bend of the superheater element; and our friend says that as soon as he sees a white cloud from the chimney, and the steam pressure drops, he knows it is time to shut down and have a clean-out.

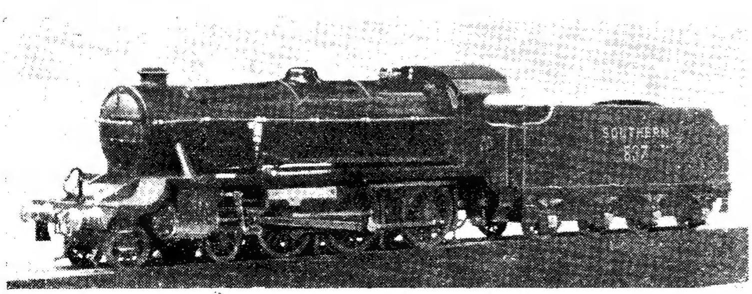
He says he didn't like to admit being stumped, and didn't want to worry me if it could be avoided, so he opened up the blast nozzle a little, to soften the exhaust, but then the engine wouldn't steam fast enough, so the original size was restored. Then he thought a "brick arch" would do the trick, and made a temporary one from ⅛-in. asbestos sheet on wire supports; but all that did, was to choke the draught and cause shy steaming again, so he took it out, and the engine was herself once more. Could I suggest anything which might prevent the tubes becoming blocked up, but wouldn't affect the engine's steaming powers?

Solution in the Tender

I asked our friend what sort of coal he was using, and he replied that he had obtained some anthracite grains from the local coal merchant; all that was available. They were very small, about ⅛-in. pieces, or about the size of lentils; but he had taken care to sift all the dust out, as per my notes. The coal lit up fairly quickly, made bags of steam all the time the tubes were clear, and did not cake or clinker; so he did not think there could be anything amiss with it. There was certainly nothing wrong with the coal itself; it was the size of the pieces that was causing his trouble. As most of our readers know, I have a fleet of little coal-fired locomotives, and naturally have had plenty of experience in the way they behave on a long nonstop run, with different kinds of coal and different methods of firing. For example, an engine with a very light blast, will steam very well, and run for an almost unbelievable time, on a thin fire composed of very small pieces of coal. The small amount of air passing through the firebars is sufficient to light up, and sustain a fire of this kind; whereas big pieces, or a thick fire, would not burn properly with such a moderate draught, and the boiler wouldn't steam. Conversely, an engine with a fierce blast, like old *Ayesha* with her worn valve-gear, or *Sybil* (L.N.W.R. 2½-in. gauge 4-4-0) with her tiny grate, prefers bigger lumps of coal, and a little thicker fire, so that cold air isn't drawn between the lumps. *Sybil* has a very similar boiler and firebox to our friend's engine mentioned above. If I feed her with very small stuff, the blast just "pulls the fire all to pieces," as full-size enginemen would say, the smaller pieces jumping right off the bars and entering the tubes. Some of these are drawn into the smokebox, and either fall into the bottom or are blown out of the chimney; you should hear the little black lassie puff when she starts two hefty adults from a dead stop! If a piece is big enough to jam in the end of a tube, or between the superheater element and the flue, a "bird's nest" forms right away, and the tube or flue is put completely out of action

Bigger Nuggets Preferred!

If the coal on *Sybil's* tender is fairly large, say in pieces of about ⅜ in. or thereabouts, she will keep going "till the cows come home," without any choked-up tubes, and very little ash in the smokebox The reason is simply that the larger bits of coal are too heavy for the blast to lift; but they light up readily, the fire being fiercer than on an engine with a soft blast. Now it seems rather a paradox that an engine with such a tiny grate (less than 3 in. long and less than 1 in. wide) should get along better with larger lumps of coal than another engine with three times her grate area; yet such is the case. My own experience is, that it takes a certain amount of steam to move a given load at a given speed, heat being the source of energy. On a very small engine, the boiler has to work far harder, to produce that steam, than the boiler of a much bigger engine, so that it needs a fiercer fire, which is only logical. Anyway, I have told our friend to scout around, and try to get some Welsh coal, either nuts or lumps, or failing that,



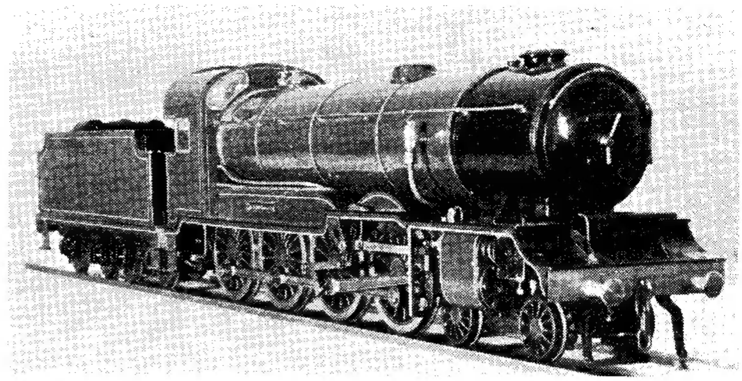
Southern S15, built by Rev. G. S. Long

anthracite nuts or peas. If he breaks the coal into pieces between say $\frac{3}{8}$ in. and $\frac{1}{2}$ in., sifts the dust out, and fires little and often, so as to keep a good bright fire well below the bottom row of tubes, he should have no further trouble. Incidentally, the full-size *Princes* were coal-eaters, albeit they did the work for what they consumed. I mentioned in reminiscences, that for some years I travelled daily between Euston and Coventry or Birmingham, when on an experimental job for a firm in the Midlands. When at Coventry, my usual train home was the 6.0 p.m. local to Rugby, changing there into the 5.2 p.m. from Crewe, which called at Rugby at 6.33 p.m., and ran nonstop to Willesden. This train was usually hauled by a *Prince*, and the normal load was 12 coaches, including two dining cars. Night after night we arrived at Euston dead on time. Naturally I soon got to know the enginemen, and heard many yarns about the engines. One fireman said that the first time he fired one, he asked the driver if they needed any special way of firing, as some engines do. The driver said, "That's all right, mate, you keep on chucking it in—she'll spit out what she doesn't want!"

Anybody Want to Build One?

Speaking about the *Princes*, there are a number of old L.N.W.R. fans who read these notes, and it occurs to me that maybe a few of them would like to build a *Prince* in $3\frac{1}{2}$-in. gauge. An inside-cylinder 4-6-0 might also appeal to others who may be a wee bit tired of the everlasting outside-cylinder jobs, but would like an engine just as speedy and powerful. If so, just sing out, and if the K.B.P. raises no objections, I could do a short serial with all the necessary drawings, including full details of the Joy valve gear. I used to know a few of the pre-nationalisation "high-ups," and one of them sent me a set of $1\frac{1}{2}$-in. scale working drawings of the *Prince of Wales* class from Crewe Works, saying that they might come in useful. I still have them; and with their aid, and my personal knowledge of the engines, we should be all set.

By the way, now that the material situation is easier, I have taken up the matter of the North Eastern 0-8-0 again; so that, all being well, those good folk who have possessed their souls in patience for so long, won't have to wait much longer. It can be built either in $2\frac{1}{2}$-in. or $3\frac{1}{2}$-in. gauge, or even in 5-in. by doubling the $2\frac{1}{2}$-in. sizes; but I wouldn't recommend it in the last-mentioned size, as it would be far too big and heavy for a single person to lift. Besides, there is far more fun in getting the power from a smaller engine; nobody would be surprised to see an elephant pulling a wheelbarrow, but, oh boy!—if they saw a mouse doing it—'nuff sed!



Mr. E. Nash's "Helen Shorter" (should it be snorter?) rebuilt by Mr. G. Cashmore

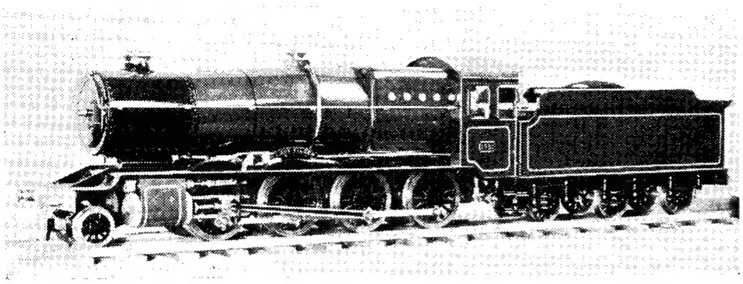
An Impromptu Test

One subject leading to another, calls to mind an amusing and appreciative letter from a Midland correspondent, who thanks me for what he says was one of the biggest thrills of his life. He was "bitten by the bug," so purchased a lathe and some tools, and built a gauge "O" *Mollyette*, to gain experience in their use. The little engine turned out O.K., so our friend decided, as a first attempt at a passenger-hauling job, to tackle *Austere Ada*. He built the tender first, to gain more experience, and then got cracking on the engine; and the chassis was in due course completed, along with another "odd job," to wit, one bogie of the *Tich* passenger car, reduced in width to suit $2\frac{1}{2}$-in. gauge.

Friends who occasionally visited my correspondent's workshop, were prone to look at the chassis very disparagingly, and pronounce with great wisdom that "a little thing like that won't pull *you*, old man!" and this was reiterated so often, that he began to wonder if it were true. Well, the proof of the pudding always being in the eating, it was decided to put matters to the test. Our friend had an old centre-flue boiler, for which he made an air-valve, and fitted a pressure gauge. This was temporarily fixed up on the *Ada* chassis. A short bit of track was laid on a staircase landing; and the single bogie, with a piece of wood laid across it, coupled up to the chassis. The boiler was pumped up to 30 lb. air pressure, our friend precariously balanced himself on the piece of wood, and then (quoting his own words from his letter), "I opened the screwdown valve, and—miracle of the century—off we went, *Ada* and I, to the limit of our few feet of track, where I had to dig my heels in to save us from going down the 1 in 2 gradient ahead, and I just sat there to recover. All this, if you please, with the stuffing-boxes still unstuffed! To say that I was delighted, was putting it mildly." I'll bet he was, at that; I still get a big kick when one of my own jobs does the doings, after a lifetime at it. Anyway, our friend concluded his letter with a "vote of thanks" for the instructions which enabled a "raw tyro" to get such good results, for which I bow gratefully; and he says that the "stolen preview of things to come" has given him a great incentive to get busy with the boiler, and complete the locomotive. Meanwhile, if we get any fine weather, he hopes to take advantage of it, to lay a line around a $\frac{1}{4}$-acre of paddock, so that the engine will have somewhere to show her prowess. Well done, "Bro. Tyro," and may *Ada the Umptieth* give you many hours of trouble-free pleasure.

Easily-made Union Cones

Two or three readers say that if they try to make union cones with a front tool ground off at an angle, as recommended in previous notes, they get chattermarks in the cones; and unless the nuts are screwed up tightly, steam or water will leak out. The trouble here, is that the lathe mandrels are a wee bit rickety-rockety, a common fault with many of the smaller cheap lathes ("cheap" in a comparative sense, I hasten to add!) which appear on the market from time to time. Chatter can be avoided when finishing the cone, by pulling the lathe belt by hand.



Mr. Pearce's Australian-built G.W.R. engine

However, perfect cones can be produced by aid of a female-ended cutter, which can easily be made with very little trouble, by anybody with the average amount of " gumption." Our Scottish friend who makes castings of girls riding in the Grand National, uses them. To make them, he chucks a piece of ⅜-in. round silver-steel in the three-jaw, centres it, and drills a hole in the middle, 3/32 in. diameter and about ⅛ in. deep. This is countersunk with a 45-deg. countersinking bit, and three cutting edges are filed around it, each being backed off. The cutter is then hardened and tempered. He cuts the countersink in the union lining with the before-mentioned countersinking bit. To make the union cone, a piece of rod is chucked in the three-jaw, turned to required outside diameter, drilled, and then the end is coned by feeding the cutter on to it, by aid of the tailstock chuck. The cone can then be parted off, and counterbored for the pipe in the usual way.

He says that the cones fit the linings perfectly; so they do—but, migosh ! fancy a Scotsman giving himself unnecessary work ! When I make similar cutters, I don't go to the trouble of drilling the hole and then countersinking it separately. Being born lazy, I just push the centre-drill in, deep enough to form the countersink and the clearance at the end at one fell swoop. When making the linings, otherwise the screwed and countersunk part of the union, I just centre same very deeply, as described in my instructions for making fittings and suchlike gadgets. All centre-drills are made with the countersinking part at the same angle; therefore, the cones formed with a centre-drilled cutter, will fit the centre-drilled sockets exactly—hoots, mon, awa' wi' ye !

What Some of " The Boys " Have Done

Followers of these notes occasionally raise a moan because reproduced photographs are sometimes few and far between. It isn't my fault; one reason is, that the drawings which I make, to help locomotive builders to do the job in the easiest possible way, take up a lot of space. Another reason is, that most of the photographs I receive, are unsuitable for reproduction, either for technical reasons, or for the aspect of the pictures themselves. Brothers of our craft in U.S.A. and Canada, sometimes send me huge batches of photographs, a dozen or more at a time; big pictures, nice and clear, but they have a common fault, inasmuch as most of them show sundry lads of the villages at various angles, with a weeny locomotive somewhere in the picture, perhaps partly hidden by—shall we say—somebody's anatomical protrusion. I'm glad enough, personally, to have the pictures, as they portray the good folk who send such nice letters, and I love to know what my correspondents look like in the flesh; but they wouldn't be of any interest to readers whose principal concern is the locomotive part. If our cousins over the big pond would take the engines solo, say from any angle which makes the little locomotive look as large as its full-sized relation, I would be only too pleased to put them in, by kind permission of our friend with the blue pencil.

Nobody has taken any photographs of my own work for many moons now, but occasionally I get two or three from readers, which might be of interest to our fraternity in general; and here are some examples of their work. The Southern S15 type 4-6-0, which is a mixed-traffic version of the "King Arthur" class, is a 2½-in. gauge job built to your humble servant's drawings and instructions, by the Rev. G. S. Long, a retired clergyman of Broadstone, in Dorset. It is our reverend brother's second attempt, his first being a gauge " 1 " *Dot*. She is a nice job, and a good hard worker, like her big sisters. He is now at work on his third engine, a 3½-in. gauge *Britannia* built to the instructions now running; at time of writing, the chassis is completed, and works very well when steamed from a stationary boiler. He had no difficulty in following the " words and music."

" Helen Shorter "

The next picture shows an interesting rebuild. This engine started life as a tender version of my *Helen Long* 2½-in. gauge 4-8-4 tank engine, the outline of which was designed by Jimmy Josslin of Toronto, Canada, your humble servant doing the needful in the way of " works " and boiler. She is illustrated in the *Live Steam Book*. The one shown here, was built some 21 years ago, by Eddie Nash; and having done some hard work, eventually arrived at the stage when heavy " shopping,"

" Mum " works the relief shift !

as it is called in full size, was urgently needed. But, alas to tell, poor Eddie's eyesight had become bad—too bad, in fact, for him to undertake the job of reconditioning the engine; so his good friend Geoffrey Cashmore, whose *Juliet* was illustrated in these notes some time ago, took on the job, with the result seen in the picture. Friend Cashmore took the opportunity of bringing the engine up to date. The original displacement lubricators were scrapped, and the rebored cylinders are now supplied with oil by two mechanical lubricators under the running-boards. One feeds one of the outside cylinders, and the other one feeds the other outside cylinder and the inside one as well. She also has an injector made to my instructions, which works perfectly.

After complete overhaul, and a repaint, she was tried on the Watford track, and proved O.K., the boiler steaming like nobody's business; and the engine breezed around with two adults on greasy and slippery rails. Friend Cashmore says she would take four, quite well, on clean dry rails. She was in steam for two hours, without the least trouble. Another good job done !

The little locomotive bearing the hallmark of the Wiltshire locomotive factory, has not been within twelve thousand miles of it ! She was built to my *Lady Kitty* design, which appeared in these notes in their early days; but the builder, Mr. H. C. Pearce, of Croydon, South Australia, made sundry alterations to bring her up to date, as did Mr. Cashmore in his rebuild. Friend Pearce didn't care for the short connecting-rods of the original full-sized engines, so he made a true Consolidation of her by shifting the drive to the third pair of coupled wheels. Incidentally, I was once informed at Swindon Works, that the second-axle drive of the full-sized engines was arranged thus, to enable the firebox to be brought closer to the third axle, and keep the eccentrics away from it. The motion was made as described for *Purley Grange*, valves and ports being made to suit. The cab was altered to the later G.W.R. type, as fitted to the "Kings" and "Castles." Instead of a displacement lubricator, as originally specified, one of the "Intensifore" force-feed type was fitted in the cab, the oil pipe to the cylinders running along the top of the left-hand splasher; it can be seen in the picture.

The boiler is fully lagged with asbestos sheet and an outer cleading, and works at 100 lb. pressure, being fired by a vaporising oil burner made in a similar way to my "axle-dodger" burner described in the *Live Steam Book*. The engine is named *Lady Eileen* after the builder's daughter, and obtained a silver medal when shown at an exhibition held by the Chamber of Manufacturers of South Australia, at Adelaide. She certainly deserved the award; hearty congratulations to our Australian friend.

It Runs in the Family !

Our last picture shows two "Maids of Kent" about to set forth on a trip per Great Western. The driver is Mrs. Herbert, wife of Syd Herbert, a Southern driver of Faversham; and if Bro. Syd misses his uniform cap, he will know where to look for it ! The engine shown in the photograph was built by Roy Donaldson, of Ashford, and is a magnificent job; Syd painted and lined it. He has built several fine locomotives himself, the latest being *Invicta*. If all goes well, I hope to show some of his work in the not-too-distant future; also some close views of the engine illustrated.

FOR THE BOOKSHELF

British Motorcycles of the Year, 1953. (London : Stone and Cox Ltd.) 160 pages, 7 in. × 5 in., fully illustrated. Paper covers, price 3s.

This is the third edition of a popular book which lists and illustrates in catalogue form every make of British motorcycle. It is divided into five sections, namely : 1, Lightweights ; 2, Power Units for Bicycles ; 3, Standard Tourers, over 200 c.c. ; 4, Racing and Competition Models ; 5, Three-wheelers. Detailed specifications and illustrations of all examples are given. A useful reference book for the enthusiast.

Britain's Racing Motor-Cycles. By L. R. Higgins. (London : G. T. Foulis & Co. Ltd.) 155 pages, 5¾ in. × 8¾ in., 61 photographs. Price 15s.

This book might be described as an adventure story, for it deals in narrative style with the history and development of British motor-cycle racing from the earliest days. It is, however, concerned not so much with the races or the riders as with the machines, and is therefore of technical interest to all who study the design of engines and other mechanical components of motorcycles. The various machines which have made racing history are dealt with in alphabetical order, and a great deal of hitherto unpublished information, including some unique photographs, is included. If there is one field of engineering development in which Britain can claim complete pre-eminence, it is surely in the design and production of motor-cycles ; and the author of this book, who is himself both a racing motor-cyclist and an authority on the history of the motor-cycle, has shown how this supremacy has been attained by the combined efforts of designers, technicians and racing teams over a period of more than half a century.

Woodwork Tools and Their Use. By Walter Covendon. (London : Hutchinson's Scientific & Technical Publications.) 304 pages, 6 in. × 9¼ in., fully illustrated in line and half-tone. Price 42s.

One of the most important items in the education of the craftsman is a proper understanding of the selection and use of tools. Not only among amateurs, but also professional workers, one often sees tools wrongly applied, or abused, with a consequent loss of efficiency or life of the tool, and to the detriment of the quality of the work produced. The author of this book, writing from experience as a practical craftsman, describes in detail all the various types of tools used for woodwork, and gives instructions, backed up with numerous operational photographs, on how to use them to the best advantage. In addition to detailed information on tools for cutting, smoothing, boring, etc., chapters are included on measuring and gauging tools, cramps and other holding devices, gluing, veneering, etc., the use of screws and nails, and drawing instruments. The book can be recommended with confidence to woodwork instructors, apprentices and students, and in fact to all who use woodworking tools for any purpose.

A SHEET METAL BENDER

By J. W. Gellatly

THIS bender is extremely simple to make, and the beauty of it is that the materials can be such as to suit the requirements of the user ; as can be seen from the drawing, the essentials are three lengths of angle-iron, $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. $\times$ $\frac{1}{4}$ in. by 18 in. for the two longer angles, and 14 in. for the shorter angle.

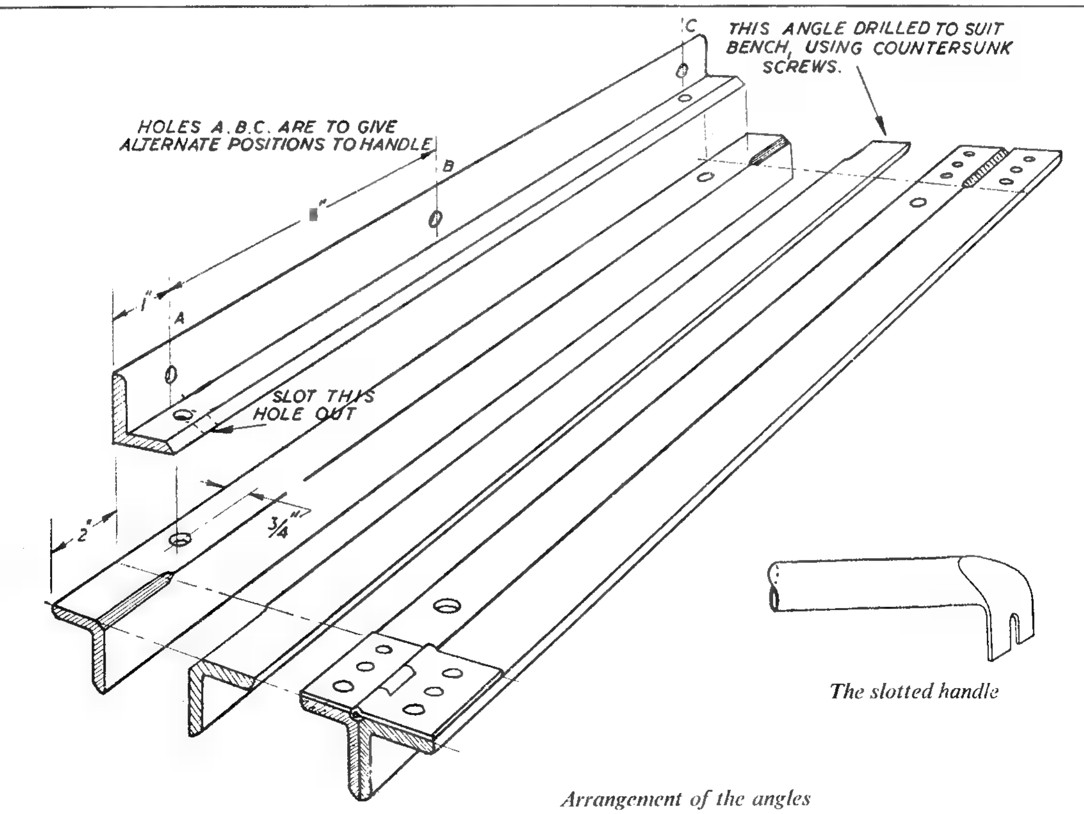
The top angle should have an edge filed as shown in section ; if you can make it about 40 deg. or 35 deg. so much the better, but be sure to leave the tiniest of flats to it, otherwise, if you make a sharp knife edge it may crumble under the crushing action which takes place when a bend is made.

The slot referred to in the top angle, is to enable it to be swung out for removal of work (i.e., in the case of a square tube, for instance, where the bending would finish up completely encircling the top angle), which also brings us to the reason for the three different positions for the lifting handle. Obviously, if the handle is at *B*, and your tube is full length of bender, then at the third bend, the handle would be in the way, so we shift it to *A* or *C*. The handle, by the way, is about 12 in. long, and can be any diameter that is reasonably substantial, and will stand flattening and bending as shown, without straightening when in use. It would also be a good plan to tap the holes, *A*, *B*, *C* at least $\frac{3}{8}$ in., and to use three set-screws, so that when the handle is altered, it will only be necessary to loosen the screws and slip the handle out of one position, and into another, without messing about with loose set-screws.

The two lower angles, you will notice, have corners filed down for a distance of 2 in. each end ; this is to enable the hinges to be set down so as to bring the centres of the hinge pins in line with the corners of the two lower angles. To make this a little clearer ; the front angle when lifted needs to pivot on its corner line ; if the hinges are put on without alteration, when the angle is lifted, it will swing out, and away from the fixed angle, and instead of a nice sharp bend being made in the job, it will have a tendency to be rounded, which is a nuisance when parts have to be fitted together.

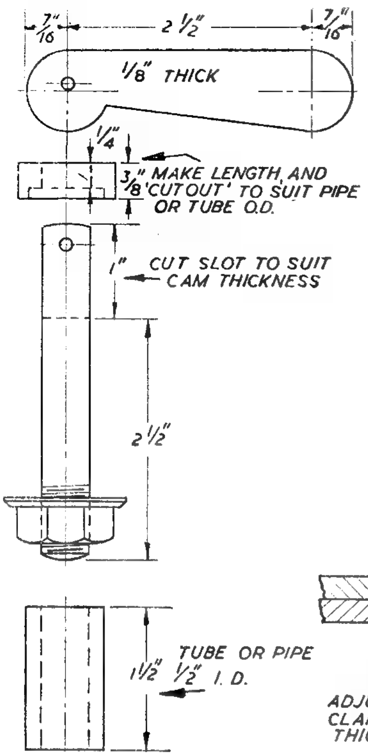
The clamp explains itself (I hope), the $\frac{1}{2}$ in. bolts having a slot cut to take the cam lever, at least 1 in. deep and $\frac{1}{8}$ in. full in width. The little pad is made to suit whatever tube or pipe you can get hold of. By this, I means that the tube can be any o.d. size (in fact, the thicker the better) and the cut-out in the bottom made wide enough to go over the tube. This cut-out, incidentally, is only to stop the pad from falling out when the clamp is operated. The assembly drawing shows quite clearly where it goes.

Make the hole in the levers at least $\frac{3}{16}$ in. with silver-steel pins, burring these over slightly each end



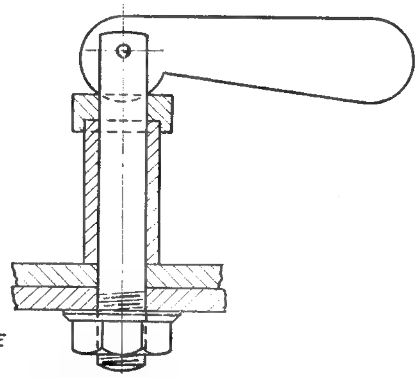
The slotted handle

Arrangement of the angles



Left—Clamp details (2 off)

Below—The clamp assembly



to keep them in place when assembled. As can be seen, this hole is out of centre to give the clamping action: About 3/32 in. ought to do it, as you can always adjust the nuts underneath to get the maximum pressure.

The hinges should be as heavy as you can get, and made of steel, so that they will stand being whacked down at the pin for the "setting" performance, this being done quite easily by fitting the hinges first to the angles and then with the two angles clamped in a vice with the hinges directly about the jaws, driving the pins down into the vee formed by the filed corners.

The back, or fixed angle, should be drilled for countersunk screws, on both faces, and it needs to be well fixed, as there is a surprising amount of pressure needed to take even 10 in. of 22-gauge sheet-iron.

The action of the bender is quite obvious; the metal to be bent is placed between the two front angles, and clamped down evenly both ends, and provided the hinges have been set correctly when the handle is lifted, a nice straight sharp bend should result.

As will be obvious to many readers, the design can be altered, and improved, in many ways, but the essentials are simple enough for those with limited facilities.

PRECISION PARTING

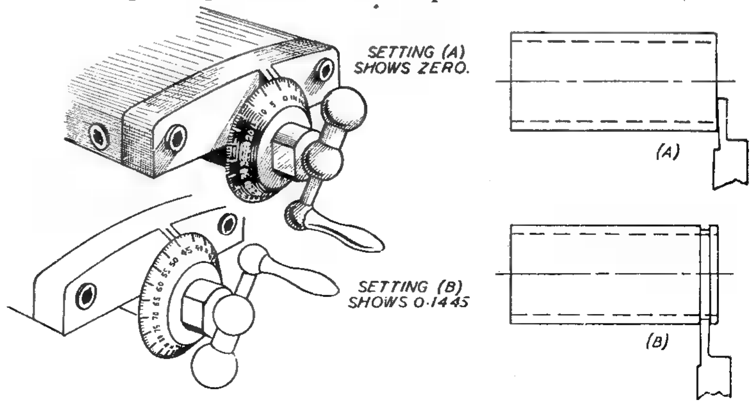
By "Scotia"

If one is to obtain accuracy of thickness in parting off, it is necessary that a method be used which employs equipment, however simple, for the purpose in hand. It is advisable when making and finishing tiny piston rings, for instance, that no rechucking should be required, in order to avoid distortion; and, provided that a 1-in. micrometer is available, and that the lathe itself is fitted with an index collar calibrated in "thous," it is a comparatively simple matter to achieve this.

Let us suppose that piston rings are required $\frac{1}{16}$ in. in thickness (or 0.0625, to give the decimal equivalent). Machining having proceeded to the parting-off stage, the parting tool is carefully examined for keenness, and touched up if necessary, as a dull spot is fatal to accuracy in parting-off. Prior to setting the tool in the toolpost, the width of cutting edge is checked, and for simplicity, let us assume that it is 0.080 in. in thickness.

The lathe is now started, and with the parting tool in position, the lightest of cuts is taken across the face. At this point, the index collar is set to zero, and adding together the thickness of the parting tool and the ring required, plus 0.002 in. for rubbing down to size, we have the figure 0.1445 in. (i.e.—one complete turn plus 44½ thou. divisions on the index in the case of a 10 t.p.i. feedscrew). The parting tool is now brought to the normal position for parting off, care being taken that the reading on the index collar is 0.1445 in.

It is quite easy to part off to within half a "thou" using this method, and very often one is "spot on."

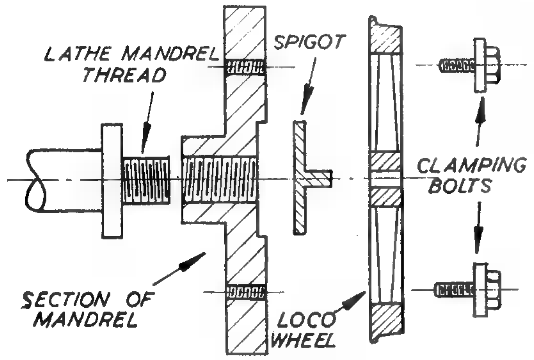


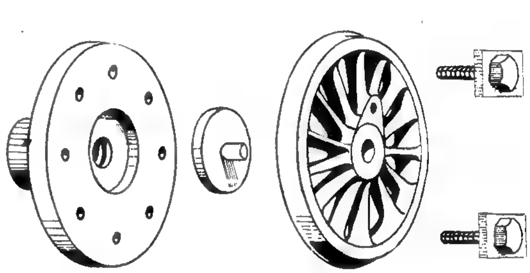
A Wheel Turning Jig

By R. H. Finnis

DURING the process of building a $2\frac{1}{2}$-in. gauge locomotive I soon discovered that the turning of locomotive wheels is not quite such an easy task, and having tried all the suggested ways and means, including those of our old friend "L.B.S.C.," found them either beyond me or not successful.

I eventually evolved the following idea which I found very simple and cheap to make, and also very useful with slight modification for other machining operations.





As a comparative newcomer to locomotive building, I submit the idea for what its worth, and will not mind constructive criticism. I have included an exploded diagram which explains more fully the principle of the jig.

I first obtained the material for the main part of the jig. Fortunately, much scraping in the bottom of the scrapbox produced an old pipe coupling, but if this is not available, a backplate casting obtainable from any supplier of castings will do the job. The size is not important, and can be varied to suit the type and size of the job the jig is required for.

First mount this in the lathe, bore and screw-cut to fit the lathe mandrel thread and machine the back faces. Then reverse and screw on to the lathe mandrel nose.

Face up and turn the outside diameter to the size required. The centre can now be counterbored, as shown in the sketch to approximately $\frac{1}{8}$ in. deep and to a diameter slightly larger than the centre bore, to allow the centre spigot to fit neatly. This completes the actual jig, and we now turn to using it for the job in hand.

Assuming that we have a locomotive wheel for machining, chuck the wheel in the lathe with the back face towards you and turn up the outside diameter of the wheel, face up the back face and in the same operation drill the wheel, and finish the bore to the final size.

Now chuck a piece of odd material and turn the end down to a good push fit in the bore of the wheel, and long enough to go through the thickness of the wheel. The outside diameter of the material is then turned to fit the counterbore of the backplate casting. It is important that these two turning operations are carried out at the same time, as this ensures that the spigot which fits the wheel bore is perfectly concentric when in use. The finished article is now parted off, leaving the flange $\frac{1}{8}$ in. thick.

It is advisable before proceeding further to drill the backplate with a series of holes, and tap out to take a suitable size bolt; these are for bolting the job to the faceplate.

To assemble, fit the spigot into the wheel with the side still to be turned, outwards, now fit into the backplate, and if all is well, the spigot mandrel should locate in the backplate counterbore. The clamping-bolts are then screwed home with packing-pieces.

The principle can now be seen, in that the jig ensures that the wheel is turned to a uniform thickness and parallel, and also that the bore is perfectly concentric with the outside diameter.

When a similar job is to be undertaken, the only new part which need be made is the small spigot mandrel, which can be turned up in a matter of a few minutes out of scrap. This saves countless hours in turning out elaborate mandrels and time taken in setting a wheel or the like true in the lathe. Provided that the two diameters of the spigot mandrel are turned in the same operation, the job must be true automatically.

CATALOGUE RECEIVED

A copy of the latest (1953) catalogue has come to hand from A. J. Reeves & Co., 416, Moseley Road, Birmingham, 12. It has a more substantial appearance than those issued in previous years, and contains particulars and prices of drawings, castings and materials for most of "L.B.S.C.'s" locomotives, including the very latest, *Britannia* and *Canterbury Lamb*. The Allchin "M.E." $1\frac{1}{2}$-in. scale traction engine, the subject of the current serial article is also featured.

Other items listed cover a very wide range that is well worthy of attention of model engineers and owners of small workshops; boiler and engine fittings, small stationary steam engines of several different kinds, useful equipment for the workshop, metal sheets, rods and tubes, paint spray guns, small tools, lathes, shapers and f.h.p. motors and starters are some of the items offered by this well-known firm, from whom this new 38-page catalogue can be obtained for 1s.

IN THE WORKSHOP

BY DUPLEX

A BENCH HACKSAW MACHINE

ALTHOUGH this machine was made many years ago and has done much useful work, its place has, for the most part, been taken by the power-driven machine described in this journal. However, visitors to the workshop have suggested that many readers would be interested in making a hand-operated machine of this kind, capable of accurately slitting components, as well as doing the ordinary work of cutting up material. Originally, the machine was made for slitting a set of draw-in mandrel collets, as, at that time, there was no proper equipment for doing this in the workshop.

The Baseplate (A)

This is made from either black or bright mild-steel plate and, after being marked-out, it is drilled for the two uprights and for fixing the soleplate of the machine vice.

In addition, holes are drilled and countersunk for the wood screws securing the baseplate to the wooden base. The design of the wooden base will be evident from the photographs, and all that is necessary here is a rigid mounting that can be securely attached to the bench top.

The Uprights (B)

Ground mild-steel is, perhaps, the best material for the uprights and, to ensure a smooth sliding motion, it is advisable to run a lap a few times from end to end of the rods to remove any high spots. The pillars are mounted between centres for shouldering their ends, and the lower ends are then threaded to take $\frac{3}{8}$ in. B.S.F. nuts.

Loose limit stops (*C*) are fitted to the pillars to keep the saw blade from falling below the level of the vice floor.

For adjusting the depth of cut, the adjustable, split, clamp collars (*D*) are machined to a close sliding fit on the pillars.

The Stretcher (E)

It is, of course, essential that the two upright pillars should be exactly parallel and, perhaps, the easiest way to ensure this is, first, to mark-out and drill the stretcher ; the stretcher is next secured in position on the baseplate with toolmaker's clamps and then serves as a guide for drilling the baseplate. The stretcher is finally secured on the upper ends of the pillars with Allen grub-screws.

The Vertical Slide Blocks (F)

These were made from $\frac{7}{8}$ in. square duralumin bar, as this material is easy to machine and has good wearing qualities. After the ends have been turned down to $\frac{3}{4}$ in. dia., the work is gripped in the chuck for drilling 12.5 mm. and reaming to $\frac{1}{2}$ in. dia. An awkward job, this, as both the drill and the reamer are only just long enough. If the bores of the slide blocks are lapped, care should be taken to use a non-embedding variety of lapping compound ; otherwise, the block itself will be turned into a lap and will wear the pillars unnecessarily. The blocks can be left a firm sliding fit on the pillars, as the weight of the saw parts and the vibration set up by the saw teeth will help to keep the saw in contact with the work.

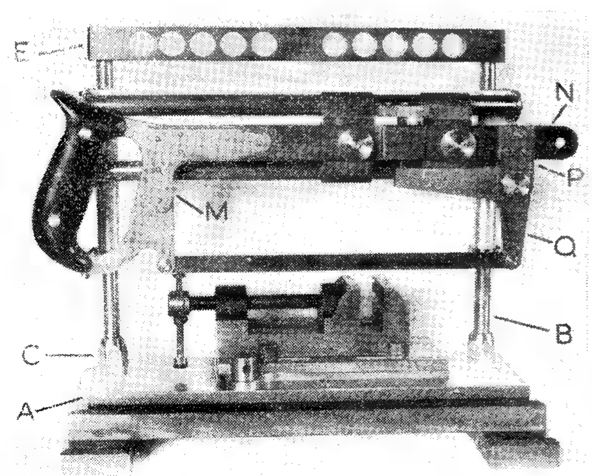


Fig. 1. A—the baseplate ; B—the uprights ; C—the limit stops ; E—the stretcher ; M—the handle plates ; N—the saw back ; P—the fulcrum plates ; Q—the bell-crank lever

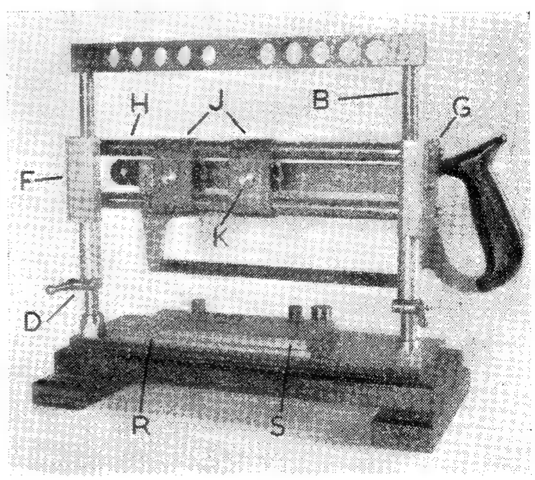


Fig. 2. D—the adjustable stops ; F—the slide blocks ; G—the slidebar plates ; H—the slidebars ; J—the crossheads ; K—the crosshead-bolts ; R—the vice soleplate ; S—the slide-plate

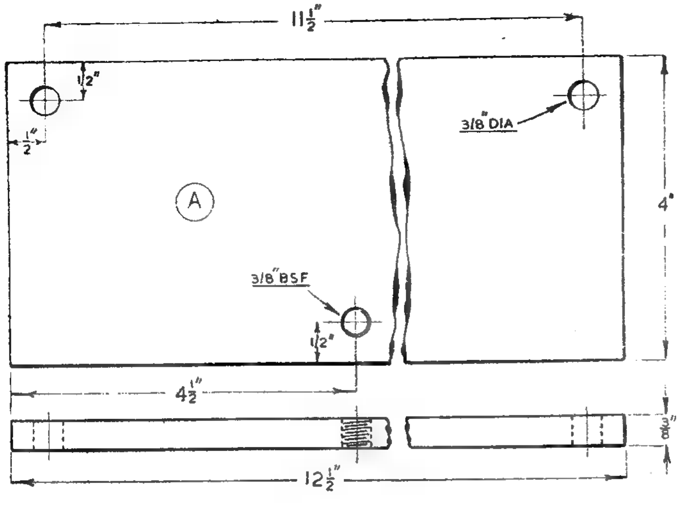


Fig. 3. *The baseplate*

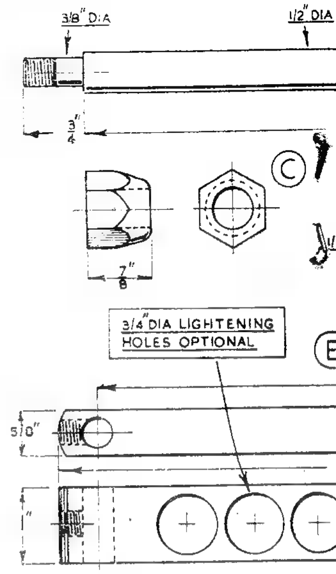


Fig. 4. *The uprights—B ; the limit-stop—C*

The Slide Bar Plates (G)

To ensure that the slide bars will be mounted parallel, the two plates should be clamped together for drilling. The slide bars (*H*) are, again, best made of ground, mild-steel and any high spots are removed be lapping. The screw holes in the ends of the bars are accurately centred by supporting the outer ends of the rods in the fixed steady and then drilling from the tailstock. When clamping the plates and slide bars to the slide blocks for drilling the screw holes, the slide bars must be set square with the baseplate with the aid of a try-square and by using the test indicator mounted on the pillar of the surface gauge.

The Crossheads (J)

If a large enough piece of material is available, the two parts can be machined in one piece and afterwards cut in two. The centres are marked-out to correspond with those in the two slide bar plates and are then drilled, bored, and reamed. Removing any high spots in the bores with a lap will make for smooth working and will reduce wear by increasing the area of bearing contact. The crossheads can now be tried on the assembled slide bars and, if they do not slide smoothly from end to end, it may

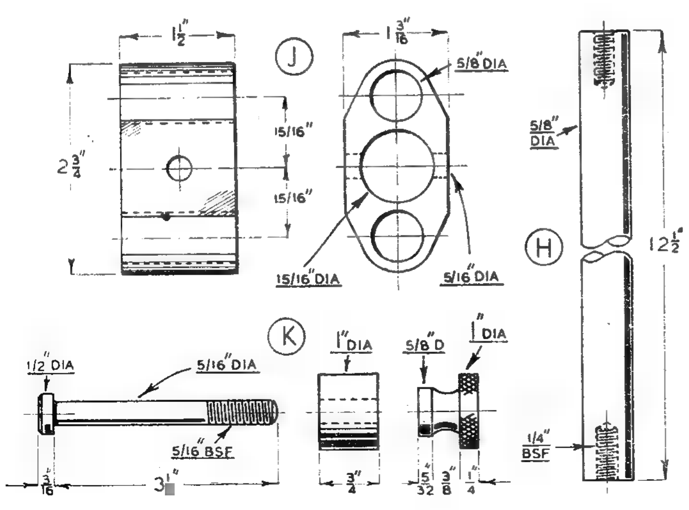


Fig. 6. *The slidebars—H ; the crossheads—J ; and the crosshead-bolt—K*

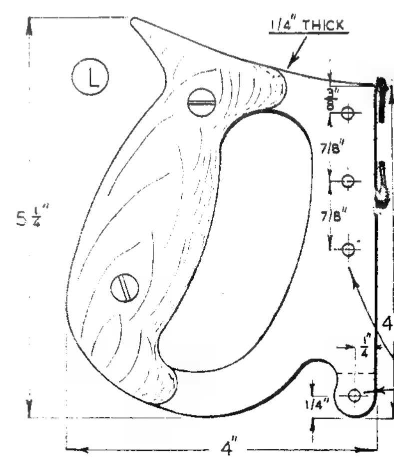
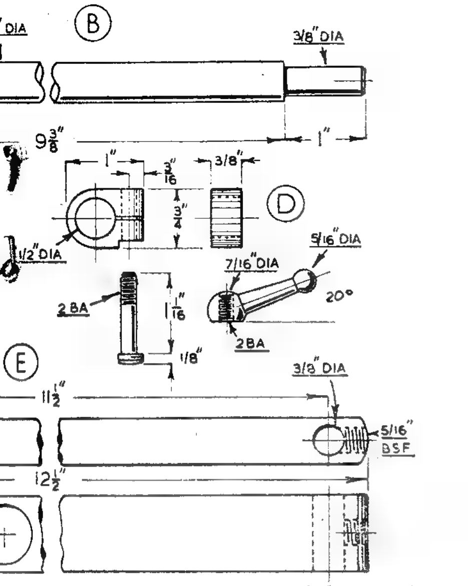


Fig. 7. *The handle—L ; and*



C ; *the adjustable-stop—D* ; *and the stretcher—E*

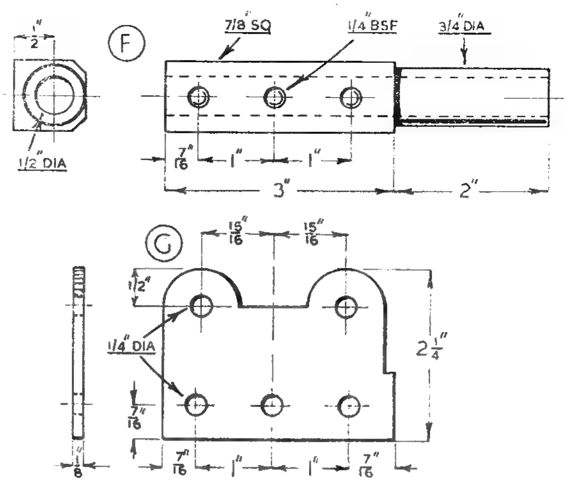


Fig. 5. The vertical slide blocks—F ; *and the slide bar plates—G*

be necessary to ease the screw holes in the plates to obtain correct alignment. The bolts (*K*) for carrying the saw frame can next be made and fitted.

This completes the parts for holding and guiding the saw frame, and the saw itself is now made.

The Saw Handle (L)

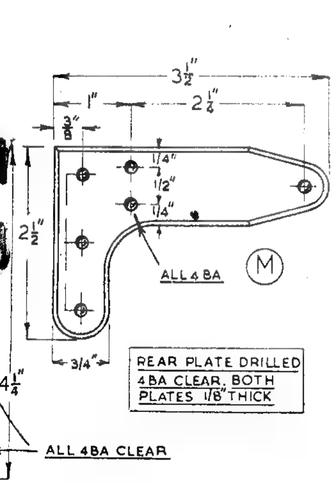
The plate to which the two wooden handle cheeks are attached is formed with a lug at its lower end for attaching the rear end of the saw blade.

For the woodwork, beech or walnut are easily shaped and take a good polish. The handle plate is attached to the saw back (*N*) by means of the two side-plates (*M*), which can be secured either with screws or by riveting.

The Saw Back (N)

As shown in the drawing, two plates are riveted and brazed to the saw back to serve as a mounting for the knurled screw that actuates the bell-crank lever (*Q*) of the blade-tensioning device. The bell-crank is pivoted on a hardened pin and is carried between the two side-plates (*P*).

On turning the knurled screw downwards, the lower limb of the bell-crank, carrying the saw blade, is moved forwards and the blade is



the handle side-plates—M

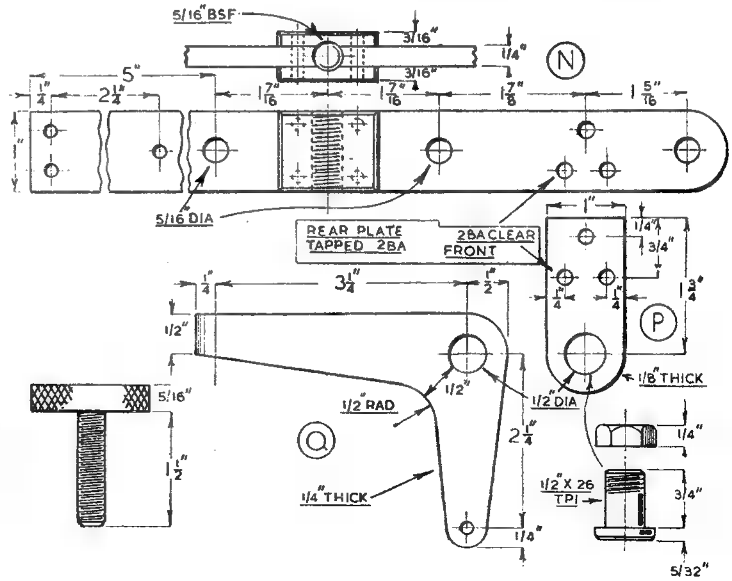


Fig. 8. The saw back—N ; *the fulcrum plates—P and cross-bolt* ; *the bell-cranklever—Q and adjusting-screw*

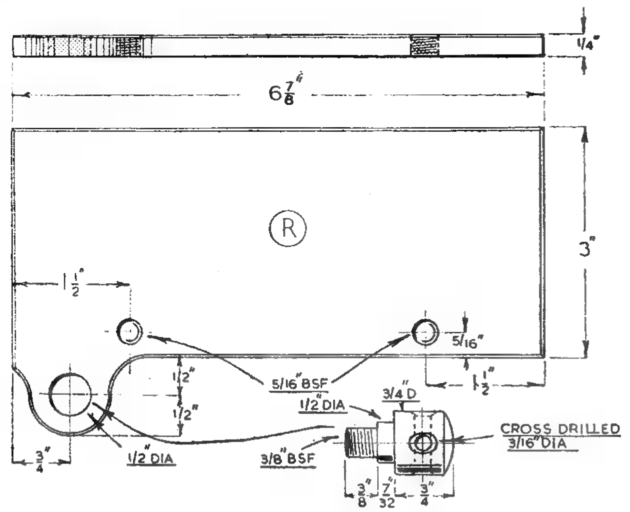


Fig. 9. The vice soleplate—R and fixing-screw .

tensioned. At its forward end, the saw back is drilled with an additional $\frac{5}{16}$ in. dia. hole ; this allows the point of attachment of the saw to the crosshead to be altered at will.

Mounting the Machine Vice

The vice fitted is a Yankee No. 990, but any other accurate vice, such as the Myford, will serve equally well. The soleplate (*R*) is secured to the baseplate with a single, round-headed fixing screw, cross-drilled to take a tommy bar. This arrangement enables the vice to be swung into any position required for angular cutting.

Attached to the soleplate is the slide-plate (*S*). This plate is formed with two slots so that, when the two fixing screws are slackened, the plate as a whole can be moved endways for a distance of 2 in. In this way, by the combined movements of the two plates, the position of the vice can be adjusted over a wide range. The range of movement can, if required, be further increased by providing additional screw holes in the baseplate for securing the sole-plate. When using the saw, it will be found that, for most work, the weight of the moving parts is enough to supply the cutting pressure, and it is then only necessary to keep the saw moving backwards and forwards.

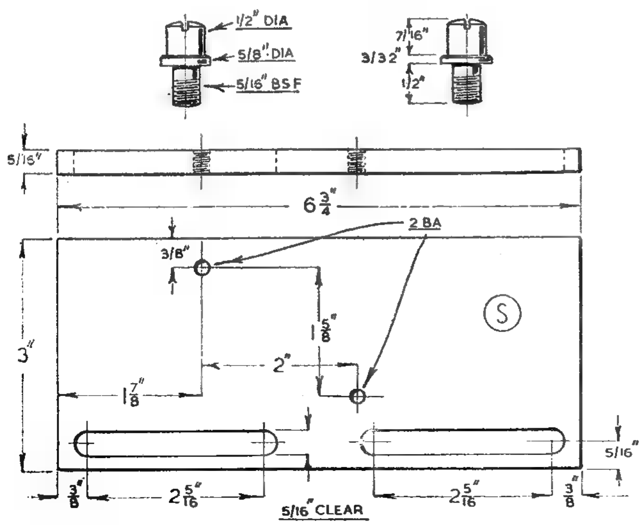


Fig. 10. The vice slide-plate—S and fixing-screws

High-speed steel blades, 10 in. in length, are normally used, and these seem to last almost indefinitely, as the guided blade is not subjected to twisting movements, as may happen in free-hand sawing. The straight-line motion also reduces blade wear and helps to preserve the set of the teeth. To reduce wear in the working parts, keep the slides clean and well lubricated.

A Screw-slotting Attachment. Fig. 11

A blade of the ordinary width can be used for slotting the heads of medium-sized screws.

For slotting small screws, a thin, 6 in. blade may be mounted in the frame by bolting a length of $\frac{1}{8}$ in. $\times$ $\frac{3}{8}$ in. steel strip to either frame lug, and the short blade is then attached to these extension-pieces. The screws are held in the fixture illustrated, and this is, in turn, gripped in the machine vice.

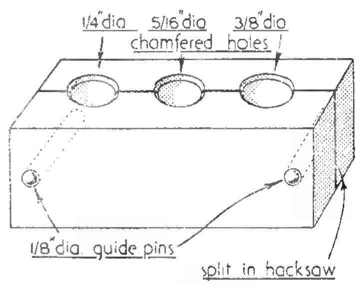


Fig. 11. The screw-slotting attachment

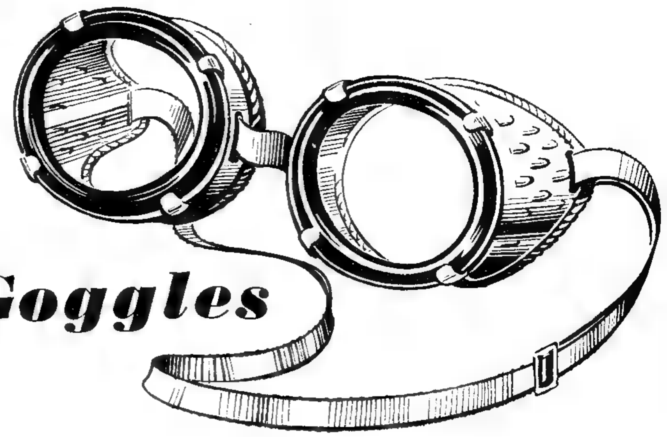
The holder is made from a single piece of steel or brass and, after the holes for the screws and guide pins have been drilled, the material is sawn through on the centre-line when held in the machine itself. If the adjustable stops on the pillars are first correctly set, a batch of screws can be quickly slotted both centrally and to a uniform depth.

Britannia had a Little Lamb!

There are many who look forward
to that distant golden day
When the lion and the lamb in peace
shall down together lay ;
But one cannot help observing that,
in very many ways,
The poor old British Lion is quite
lamb-like nowadays !

—Anon.

Fitting Lenses to Workshop Goggles



By Niall MacNeill

HAVING recently purchased from a MODEL ENGINEER advertiser (K. R. Whiston, New Mills, Stockport) some ¼ in. round plastic belting, I had a brainwave which led to the successful solution of an old problem.

I have for long wanted a pair of workshop goggles which would incorporate lenses to suit my eyesight. Either I relied on the spectacles alone, or, if I thought there was a risk that something might fly off and break them, resorted to the awkward expedient of using goggles over them.

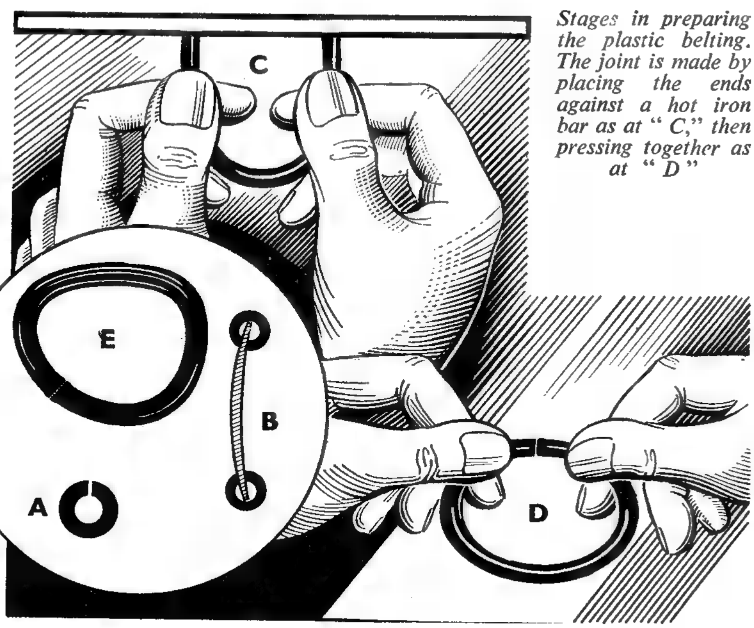
Having noted that the plastic belting is hollow-cored, I tried out my idea on the lenses of a spare pair of spectacles. An old pair of goggles, having safety glass "windows" in aluminium mounts, were available. Anyone familiar with this kind of goggles will know that the aluminium parts can be quite easily bent by hand. They were now similarly moulded towards their front edges to conform roughly to the shape of the spectacle lenses. This can be done without impairing the mounting of the safety glasses by the four aluminium lugs.

Preparing the Plastic

Two pieces of plastic belting were then cut long enough to give each spectacle lens a surround or frame of this material. A longitudinal slit, as shown in section at *A* was then cut full length in each piece, using small scissors. The edges of the lenses could now be pressed right into the slit, as shown in section at *B*.

The pieces of plastic were next "butt-welded" into rings, so that the longitudinal slit lay on the inside of the finished ring and met itself fairly accurately at the joint. The slit was closed locally at the weld, but was easily re-opened with the scissors.

The plastic "frames" so made were just sufficiently bulky to prevent the lenses touching the safety glasses, and to make them a gentle push fit into the aluminium mounts, so that the lenses were just behind the safety glasses inside the goggles. They stay in place by sole virtue of the springiness of the plastic, but can be removed without any great difficulty for cleaning. I may add that I have had no more trouble with condensation than in using the goggles without the lenses—sometimes a slight trace to begin with, which goes away of its own accord.



Stages in preparing the plastic belting. The joint is made by placing the ends against a hot iron bar as at "C," then pressing together as at "D"

Method of Jointing

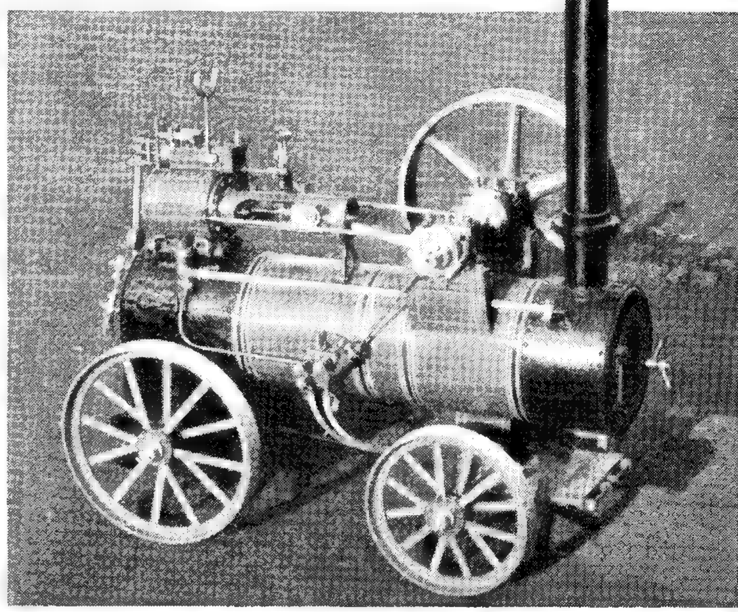
A simple method used for butt-jointing the plastic may also be of interest. A scrap piece of iron bar was supported in an old machine vice and made fairly hot (not red). The ends of the plastic were applied to it for a moment with light pressure, as shown at *C*. The ends were then applied to one another, with stronger pressure, as at *D*. It is a good idea to have a basin of cold water handy to plunge the job into whilst still under pressure—otherwise it will be necessary to wait some time for the weld to set. *E* shows the "butt-welded" plastic ring after it has been sprung over the lens.

Incidentally, when cutting the slit, advantage should be taken of the "bias" which the material has acquired from being kept in a coil, by slitting on the inner surface of the curve.

It occurs to me that this idea may have other applications, such as providing an unmounted magnifying lens with a frame which will protect its faces from scratching.

A Model Ruston Portable Engine

By Gilbert T. Williams



On the cover of The Model Engineer for December 7th, 1950, there was a coloured print of a Ruston portable steam engine. This greatly appealed to me as a very beautiful machine, and as I had just finished a 2 in. scale traction engine and had no other model in hand, I thought how nice one would look built to a fairly large scale. On measuring the print, as near as I could guess, a boiler about 5 in. diameter would be just about the right size for a 2 in. scale model. Looking round my workshop, I found I had about 18 in. of solid drawn copper tube, 5 in. outside diameter and about 3/32 in. thick. As an engine of this type is run at a fairly low steam pressure, I thought this was just the thing and decided definitely to have a go at making the engine.

First of all, I wrote to the makers to know if I could obtain blueprints; but they wrote stating that this was an old type and they were sorry to say all blue prints had been lost or destroyed. However, they lent me an old catalogue giving several prints of this and other engines from different angles, also a drawing showing a section through cylinder, and from these I was able to make rough sketches of the different parts.

I then made a full-scale drawing of engine showing side elevation, also one from back showing fittings on boiler, etc. Then I made a start on the boiler.

I cut my 5 in. diameter tube to a length of 12 in. for the boiler barrel, after which, I made throat plate and backhead from $\frac{1}{8}$-in. copper plate, riveted 3/32-in. copper wrapper on these with 3/32-in. rivets putting in the numbers of rivets shown on The Model Engineer print. I then marked out positions of rivets on remainder of boiler for stays, but these are dummies and only reach through the outer wrapper.

I next fitted the axles for back wheels to wrapper and the two lugs for pulling boiler backwards; also, lug for stay-rod from throatplate to front axle and four angle-pieces for holding the ash pan. I made the firebox from 3/32-in. copper, except the backplate for tubes which is $\frac{1}{8}$ in. thick. I left $\frac{3}{8}$-in. water space round firebox.

The tubeplate in front of boiler was made from $\frac{1}{8}$-in. copper plate, flanged on a wooden former, drilled for the tubes and riveted in position. The saddle for cylinder was made from 3/32-in. copper, first bent to the shape of the boiler top, but to the right of the centre. Then a saw-cut was made lengthways but not in the centre, and stopping $\frac{1}{2}$ in. short of each end. End cuts were made and the centre opened out, which left both ends opened, and in these were fitted two pieces of copper $\frac{1}{4}$ in. thick. An oblong plate of copper $\frac{1}{8}$ in. thick was fitted over the lot. This was made horizontal when the plate was in position on boiler, and the lot brazed. The boiler has nine $\frac{9}{16}$ in. diameter tubes and one $1\frac{1}{2}$ in. diameter tube fitted with six $\frac{1}{2}$-in. cross tubes.

The next job was to make the two supports for the main bearings. These consist of two copper plates $\frac{1}{8}$ in. thick riveted at the top to a piece of steel, $\frac{1}{2}$ in. wide by $\frac{3}{8}$ in. thick, and then bent to the correct shape, riveted and brazed to boiler barrel.

The saddle for the fore-carriage in a portable engine comes under the front of the boiler and not under smokebox as in a traction engine. This is a built-up affair consisting of two copper side plates flanged to rivet on boiler barrel and screwed and brazed to a square steel plate at the bottom for the fore-carriage to turn on.

The pump seating was then made ready to be brazed to boiler; also the dummy manhole and the fitting for water filler; seatings for water gauge and pet cocks, and boiler was now ready for brazing. I did not attempt to do this myself, but took it over to Mr. Kennion at Hertford. He made a very neat job of it and put stays in the firebox, filing them off flush with the outside wrapper.

Meanwhile, patterns were made for the cylinder, which is steam-jacketed but sufficient metal was allowed on the left side to drill for

ports; the exhaust is by a $\frac{1}{2}$-in. copper tube passing just under cylinder lining and having a T-bend with flange on where it emerges from the cylinder. The lining for cylinder is phosphor-bronze and piston is also phosphor-bronze packed with graphited asbestos yarn (I never put rings on bronze cylinders).

Cylinder covers are of steel and the front cover is turned to take the back end of the trunk guide for the crosshead. Crosshead is steel and trunk guide gunmetal. The front of this guide is supported by a small vee-shaped bracket. The cylinder is $2\frac{1}{4}$-in. stroke and $1\frac{5}{8}$-in. bore. Just over the steamchest is an oblong gunmetal casting, the front half of which is cored, and steam from boiler is free to collect there. In the other end is the valve of the governor which, when open, lets steam direct into the steamchest. Over this casting is another oblong casting also cored at front. On top of this are the two safety-valves, and about half way along is the starting valve—a kind of mushroom disc which is pulled back from its seating by the starting lever; when open, it lets steam pass to the governor valve. But the starting valve has two actions. The main valve has another tiny valve going through its centre, and is allowed a movement of about 1/32 in.; it opens before the main valve can do so. Thus, if the starting handle is pulled slightly, this little valve only is opened; only a small quantity of steam can pass and the engine just turns over. A longer pull on the lever opens the main valve, and a full head of steam is released. I believe this is a Ruston patent.

The safety-valves are the old-fashioned spring and lever type. A tension spring is enclosed in a brass tube $\frac{1}{4}$ in. diameter. I had trouble with these at first; I made mushroom valves, as in the real engine, fitting a $\frac{5}{16}$-in. hole; but when I tested by compressed air, they lifted at 20 lb. pressure. I did not want to use stronger springs because they would have looked clumsy, so I rebushed the valve seating and used $\frac{3}{16}$-in. rustless steel balls over a 5/32-in. bore. These were quite successful.

The governor casting was a bit of a puzzle because it has a rod through it to work the governor valve; also, a guide for the slide-valve passes through it lower down. However, I managed to purchase some suitable gear-wheels from a firm advertising in THE MODEL ENGINEER and afterwards made a suitable pattern and had a gunmetal casting made from it.

The main bearings offered no difficulty. A pattern was made, cast-iron castings were obtained locally and split gun metal bearings fitted. These are $\frac{7}{8}$ in. wide and $\frac{5}{8}$-in. bore.

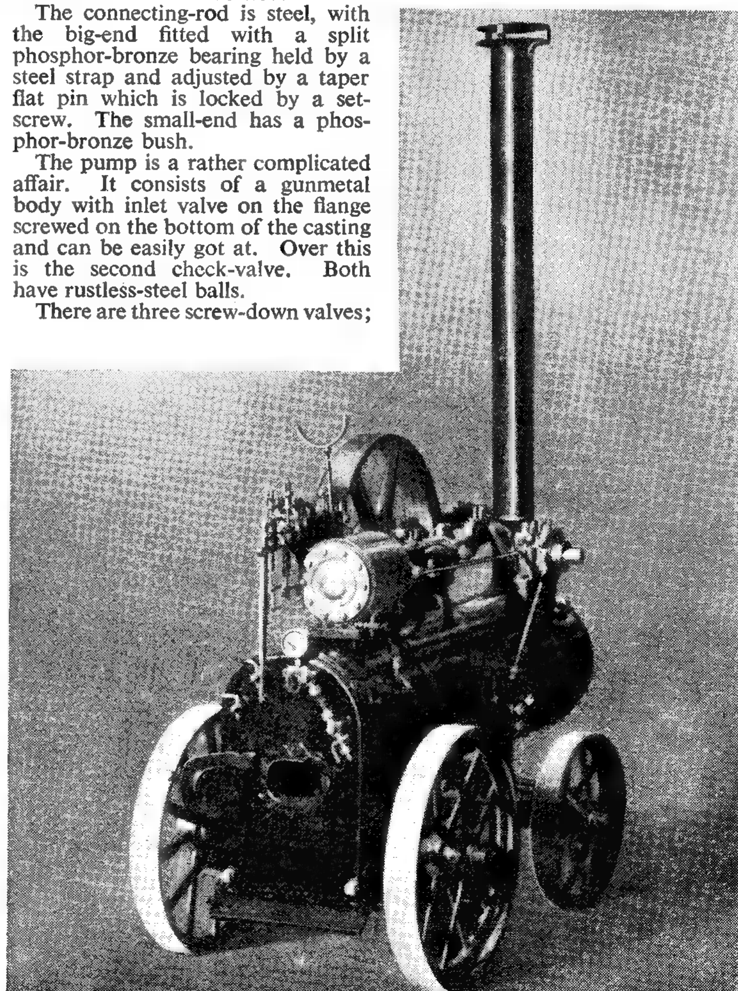
The crank is steel and was made from a bar 10 in. long $1\frac{3}{4}$ in. wide and $\frac{3}{4}$ in. thick. It was finally turned down to $\frac{5}{8}$ in. diameter. Keyways were cut for the flywheel and pump eccentric, and, to make it look more real, the webs were filed to a round shape. I find it is next to impossible to bend a crank from round metal. The eccentric itself is loose on the shaft, but has a stud on it which passes through a slot in a fixed collar on the crank-shaft. When the nut is tightened, the eccentric is locked. By this means, the engine can be easily reversed and, at the same time, cut-off can be altered if desired.

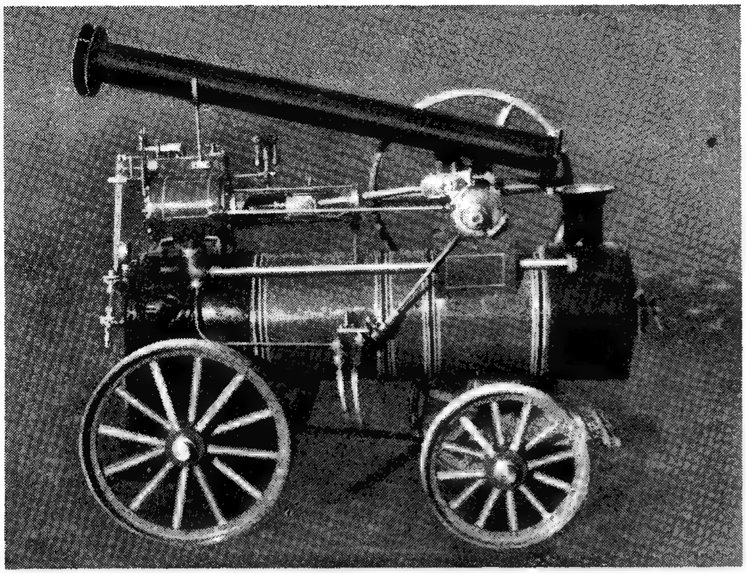
The connecting-rod is steel, with the big-end fitted with a split phosphor-bronze bearing held by a steel strap and adjusted by a taper flat pin which is locked by a set-screw. The small-end has a phosphor-bronze bush.

The pump is a rather complicated affair. It consists of a gunmetal body with inlet valve on the flange screwed on the bottom of the casting and can be easily got at. Over this is the second check-valve. Both have rustless-steel balls.

There are three screw-down valves; the one on the right screws down on to the bore into boiler; the bottom one on left, when open, allows water to bypass, and the one on top on left, when opened, allows steam from exhaust to pass into the water supply. So that there may be no breakage if valve shutting off supply to boiler should be closed, a relief valve is fitted on the pump cover. Stroke and bore of pump are $\frac{3}{8}$ in.

The smokebox was next taken in hand; it is $5\frac{3}{4}$ in. diameter and $3\frac{1}{2}$ in. long. First, I cut a ring $1\frac{1}{4}$ in. long from the remainder of my 5 in. diameter tube. On a wooden former I expanded this to fit nicely over the boiler end. Then on another former it was expanded to $5\frac{1}{2}$ in. diameter. Then a flanged ring of copper was made for the smokebox front, also $5\frac{1}{2}$ in. diameter. Another $3\frac{1}{4}$ in. was cut from my 5-in. tube, sawn through, bent round these rings and





a piece brazed in to fill up the gap. Smokebox was then riveted. The door was made from copper bent to shape on a wooden former, and inside has a round plate over asbestos to keep it cool.

The chimney is copper tube $1\frac{5}{8}$ in. outside diameter. Gunmetal rings were cast for the hinged part, but the bottom was flanged to fit the smokebox. The top of chimney was a flanged copper plate. Total length of chimney is just over 23 in.

A special casting was made for the exhaust steam. As shown in one of the photographs, a $\frac{1}{2}$ in. diameter copper tube takes steam over the boiler barrel into the smokebox, where it is connected to another tube which takes it up the centre of the chimney stack. But at the bottom of this fitting is a 5/32-in. tube which allows a quantity of steam to go into the water supply if desired.

The boiler was lagged with $\frac{1}{8}$-in. asbestos sheet, which in turn, was covered with thin sheet brass held by four brass bands. The flywheel was a straightforward job. A pattern was made and a casting obtained locally. It is 9 in. diameter and $1\frac{5}{16}$ in. wide.

The ashpan is made from sheet-iron and presented no difficulties. It has four lugs to correspond to those on the boiler and is bolted on by four 3/32 in. bolts and nuts. The door has a ratchet movement and can be set just open or fully open.

The fire grate is a cast-iron casting and can easily be removed in the following way: near each side of the ash pan at the back is an inclined step on which the back of the fire-grate rests; at the front of the ash-pan, near the top, is a sliding rod on which the front of fire grate rests. When this rod is removed, front of grate drops and can be pulled out of the ash pan and cleaned. To replace, it only has to be pushed in again, up the inclined steps lifted up in front by fingers and the rod slipped along.

All four wheels were built in the same manner. They have gunmetal hubs consisting of centre-piece, back and frontplates. The centre-piece has six slots milled out each side to take spokes. The backplate has a spigot which is turned to fit the hole in hub centre and bored to fit axle. Frontplate screws on to spigot of backplate, and hub caps also screw on to this. Both front and backplates are screwed through spokes and the whole then soldered together.

The spokes are riveted to the rims by one 3/32-in. iron rivet to each spoke. The back wheels are $8\frac{1}{2}$ in. diameter by $1\frac{1}{8}$ in. wide, and the front wheels are $6\frac{1}{2}$ in. diameter by 1 in. wide. The front axle is made from a bar of steel $\frac{3}{4}$ in. $\times$ $\frac{1}{2}$ in.

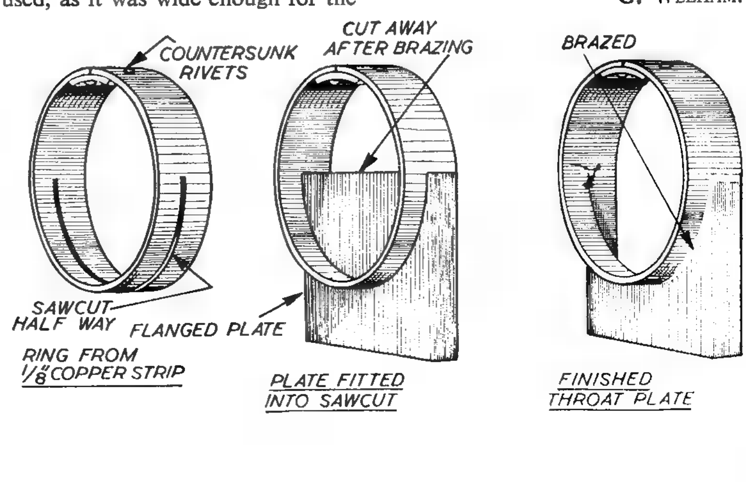
The fore-carriage is built from $\frac{1}{16}$-in. steel plate, strengthened at side with $\frac{1}{16}$-in. strip and at front with $\frac{1}{8}$-in. angle-iron $\frac{5}{8}$ in. $\times$ $\frac{5}{16}$ in. This has four lugs screwed in to take the drawbar, which is 5/32 in. thick and $4\frac{1}{2}$ in. long.

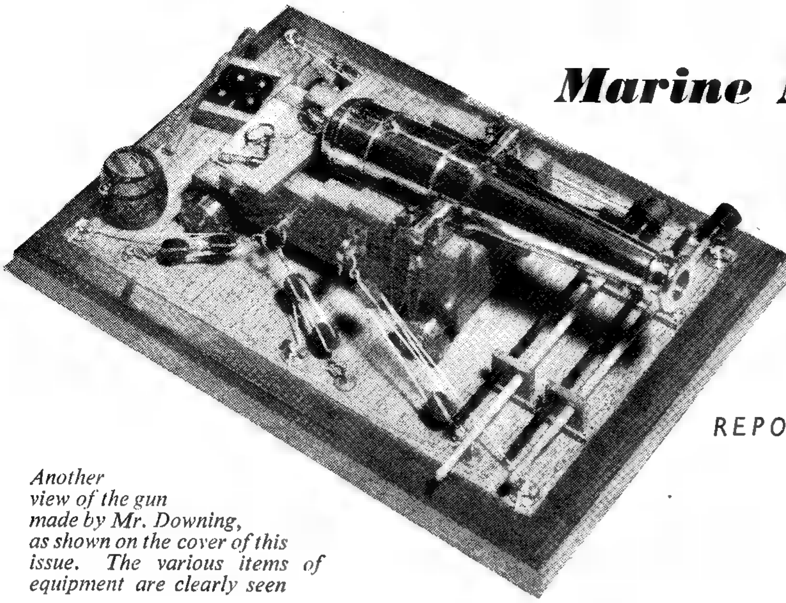
Wheels and fore-carriage are enamelled bright red. Boiler barrel, flywheel and cylinder are bright green, also hubs of wheels and pump body. Smokebox, chimney and firebox are black. Lining on boiler is black, yellow and red. Wheels and fore-carriage are lined orange. The photographs accompanying this article are by D. S. Donnison, Chalfont St. Giles.

MAKING A BOILER THROAT-PLATE

WANTING a throat-plate for a traction engine I am building, and not being able to make it the usual way, I thought out the following method :—

First, a ring is required which must be a good fit in the barrel; in my case a strip of copper $\frac{1}{8}$ in. thick was used, as it was wide enough for the job. This was bent into a circle and the joint riveted, then a saw cut was made half way through; the plate, flanged for the corner joints was inserted in the cut, and after brazing, the surplus metal inside the ring was cut out. The result is a neat and easily made throat-plate.—
G. WELHAM.





Marine Models at the NORTHERN MODELS EXHIBITION

REPORTED BY "NORTHERNER"

Another view of the gun made by Mr. Downing, as shown on the cover of this issue. The various items of equipment are clearly seen

IN my preliminary report of the Northern Models Exhibition, I mentioned that there was room for improvement in all the marine models, and as an example I dealt at some length with the winner of the first prize, the free-lance luxury liner built by W. E. Barnes.

A ½-in. scale model of a sea-going motor yacht was awarded the second prize, but it is proposed to devote a separate article to this boat in a future issue because of the internal detail, which included full furnishings.

A Model "Mauretania"

Next on the list was a very imposing model of the *Mauretania*, built to a scale of ⅛ in. to 1 ft., by W. and A. Derbyshire, of Liverpool. This vessel was about 8 ft. in length, and, as the photograph which was reproduced on the cover of the April 23rd issue shows, gave a very good representation of the prototype.

As is to be expected on a model of a large liner, there was a wealth of detail on the decks, and on the whole this was quite well carried out, including particularly the windlasses and winches. The soldering of the rails, too, was painstaking, and the companion ladders were neatly made.

The hull was plated, in metal strips, but unfortunately was very "wavy." It is recognised that it *is* very difficult to solder overlapping strips of thin metal without it buckling somewhat, but one felt that since the builders are sheet-metal workers, they of all modellers should have been able to overcome the difficulty!

Incidentally, the interior of the hull was left very rough—and that is one of the points that the judges consider.

Another feature detracting from realism was that the rails on the boat deck were secured to plates which were fastened to the deck with countersunk-headed screws. The deck-planking, as on the free-lance liner, was scored too heavily—about 1/32 in., or, to scale, 3 in. wide! And the paint could have been smoother, too.

But certainly on the water this must be a very impressive model, and at night, with her rows of lighted ports and her floodlit funnels, she will look very realistic.

A 1-in. Scale Lifeboat

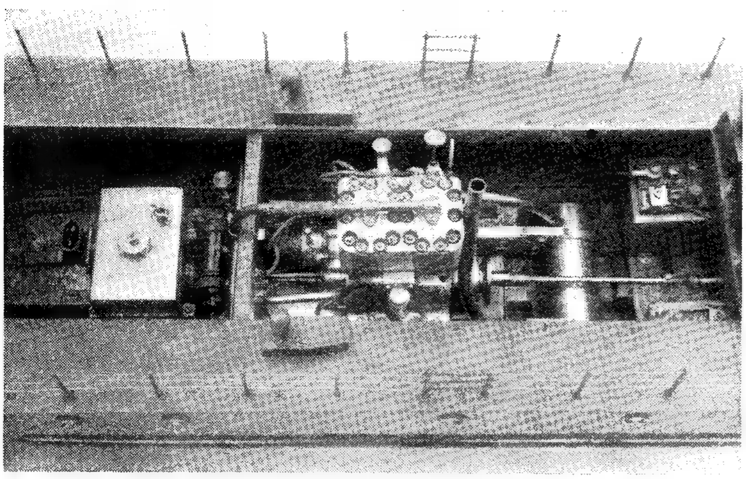
The lifeboat as a prototype makes for an interesting model, and seems to be gaining in popularity. K. W. S. Turner, of Macclesfield, who is a member of the Altrincham Model Power Boat Club, had a very nice example on show at Manchester, built to 1 in. scale.

In this size, of course, the detail on deck can be sufficiently robust to stand handling, and Mr. Turner's decks had the characteristic crowded, yet tidy, appearance of the full-sized boat.

The hull had the twin screws in tunnels, and the drive was electric, with a 2 to 1 reduction gearbox. It is understood that the model was built with steering competitions in mind, and that she has been quite successful in these; at the same time she possesses a useful turn of speed.

Again it has to be remarked about the finish that it was was rather rough as to paint and varnish—for example, in the dark-blue paint there were "runs" in places. A photograph of this model lifeboat

This ½-in. scale model of a "Fairmile B" motor launch, built by J. Bagshaw, was driven by a twin-cylinder petrol engine



The very neatly arranged engine-room of Mr. Bagshaw's "Fairmile"

appears on page 436 in the April 9th issue.

Highly Commended

During the last war nearly four hundred 112-ft. Fairmile, Type B, motor launches were built, and used on many varied duties. Excellent sea-boats, with clean hull lines, many of them since the war have been converted into private yachts, while others are now seaside "tripping" vessels. However, J. Bagshaw, of Withington, had chosen to model the vessel as originally built, and the photographs show the neat and workmanlike job he had made of it.

But once more there were many points of criticism about the finish. The hull was diagonally planked on stringers, and formers; but the joints of the planking should *not* be visible through the paints: nor should the three plies of the deck be visible on its edge! Similarly, the grain of the wood was visible through the deck-paint: all these things would be cured by "filling" before painting, and by ample rubbing down and several coats of paint (with, of course, a good rubbing down between each successive coat!).

For some unfathomable reason—because Mr. Bagshaw obviously has good metal-working facilities—the bollards were wood, with the grain visible. Neat fairleads were secured with very obvious countersunk screws, and so was the deck to the hull, a most undesirable and totally unnecessary practice.

Other deck fittings, including the armament, were robust, and gave a good impression at a distance, but at ½-in. scale they might well have incorporated more *small* detail to make them more worthy of *close* inspection.

Neat Engine Room

But it was in the engine-room that Mr. Bagshaw really scored, for this was well thought out and well executed. A twin-cylinder side-valve water-cooled engine was fitted, driving through a universally-jointed propeller-shaft to the gearbox, from which the twin propellers were driven. A forward extension of the crankshaft drove the water-pump, which was a separate unit, above which the coil was mounted in neat stirrups. In front of the unit was the rectangular petrol-tank, feeding by gravity to the float-chamber of the carburettor.

The engine was carried on neat girders, milled from aluminium or duralumin; these were extended forwards to carry the tank and the pump, and rearwards to carry a neat transverse silencer. From the latter the exhaust was led back to the funnel.

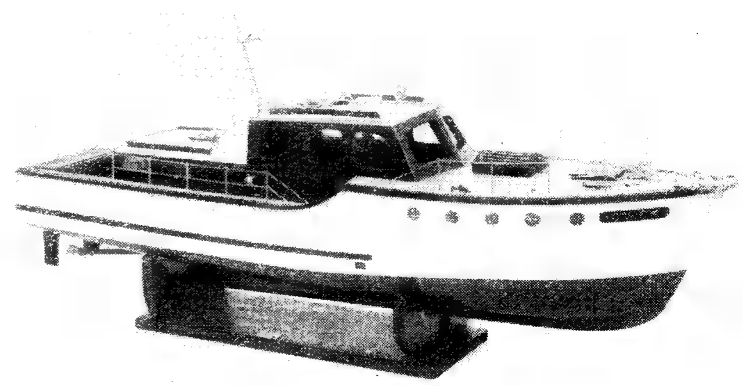
Other Power Boats

My next photograph shows a ¾ in. scale cabin cruiser built by S. Davison, of Sheffield, to which many of the remarks already made about finish must also be applied. In particular the deck fittings could have been very much better.

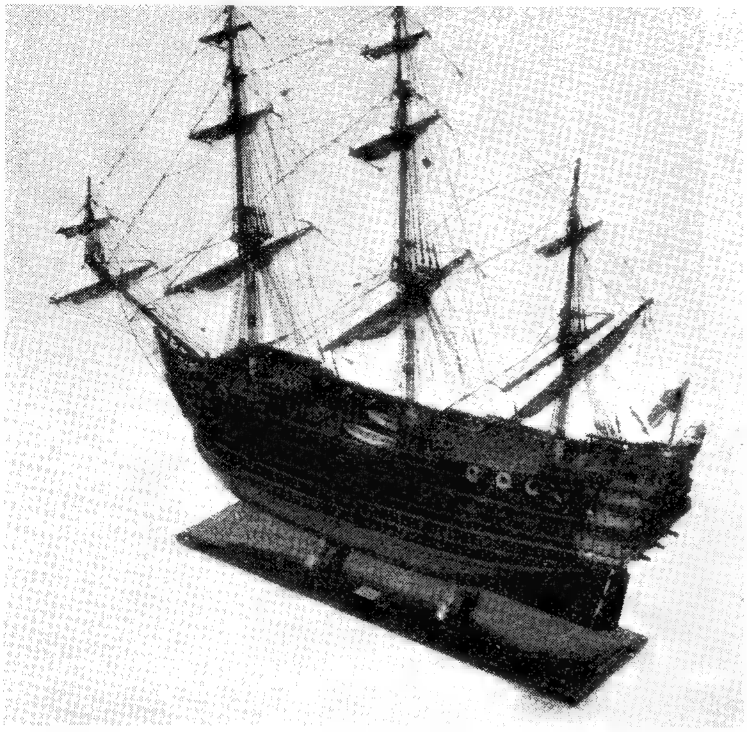
The engine room was quite neat, with a small "diesel" engine, fan-cooled, mounted in riveted-up aluminium bearers. A good idea was that the flywheel incorporated a simple clutch, operated by lever from the cockpit, so that the engine may be started on the bank without the risk of the propeller chewing up one's fingers as the boat is put in the water.

H. Baddley, of Newton-le-Willows, had a very nice little cabin cruiser, *Liverpool Bay*, about 2 ft. long and ⅜-in. scale. This boat had a hard-chine hull, ply built on stringers and formers, and the engine-room arrangement was unusual for such a small model. Actually, the engine was missing at the exhibition, but its mounting was towards the stern. From here a shaft with two universals drove forward to a gearbox in which reduction gears drove the twin propeller shafts through dog clutches, which had rubber inserts to prevent noise. Twin silencers and exhausts were used, and one presumes, but cannot be certain, that the engine would be fitted with a fan to cool it.

In my preliminary report of the show, I mentioned the 55-in. tender with six-cylinder petrol engine, loaned by F. W. Waterton. The hull of this boat was of very interesting design, with a hard chine section



A twin-screw cabin-cruiser, built to ¾-in. scale by S. Davison, of Sheffield



A 90-gun ship of the period 1690-1710, *winner of the first prize in its section*

from bows to step. Aft of the latter, however, the section was round-bilged, but faired off into a hard chine again as it approached the stern.

The sheer was a reversed curve, and the nice lines included a pronounced flare at the bows. Planked diagonally with $\frac{1}{16}$ in. ply, the hull was built on ply frames with $\frac{1}{8}$ in. by $\frac{1}{2}$ in. stringers. Oak bearers were fitted for the engine and gearbox, and there were twin rudders.

A pleasing feature of the junior section was an array of nine police-launches, by boys of the Towneley Technical High School Modelling Club. In these, of course, one did not expect a perfect finish, and so one was not disappointed ! But in congratulating the teacher who must be the real driving force behind the display, and who, I feel sure, must be a modeller of some experience himself, I may perhaps express the hope—probably unnecessarily— that he will continue to emphasise to his pupils the desirability of patience, and more patience, in the finishing of their models.

Non-working Ship Models

In the non-working ship models, the winner of the first prize was the 90-gun ship (*circa* 1690-1710) built by S. W. Catchpole, of Timperley. This model contained a large amount of detail, but much of this was rather crude, as was the finish in general. The deck planking was uneven in breadth, with grooves too wide, the sails were too coarse, the hull was insufficiently rubbed down, the paint was gummy, and so on. As for the fitting of some of the pieces, notably at the stern galleries, some of this was definitely poor, especially since Mr. Catchpole is a fitter by trade, and, therefore, presumably used to accuracy in his work.

Much to Learn

From the fact that this model won in its class, despite its defects, it will be realised that the other exhibits in the section were equally, or even more, disappointing. When one compares them, in the mind's eye, with masterpieces that have been seen at other exhibitions, one realises that their builders have much to learn.

Nor does this apply only to this section, but also to many of the marine models. It does not need a " Jason " or a Bowness to notice rough paint, treacly varnish, heads of countersunk screws, and the various other defects that have been criticised in this article. Some of them may not be noticed particularly by the man-in-the-street, but they should be obvious—or most of them should—to the builder of the model himself. Attention has been drawn to them in the past, by many writers on many occasions, but still they crop up, time and again, like weeds in a garden !

Helpful Advice

It is easy to criticise, of course, but it is even easier to be blind to the faults of one's own work. Judges approach their task in an impartial manner, and it would probably be good for a competitor's future work if he could receive a detailed critique from them of his present exhibit. Since this is obviously impractical, it is hoped that my remarks will be taken as a substitute. They *are* meant to be helpful, even though, at first, they may not be too palatable !

Multicore Tape Solder

A new addition to the range of well-known Multicore solders is now being produced in the form of flat ribbon or tape which facilitates its use on many kinds of light work, and embodies in addition all the properties of the earlier Multicore products, being a normal tin-lead alloy with cores of Ersin non-corrosive flux. It can be used in the ordinary way, with a soldering bit, but is of special advantage for work in which a flame is directly applied. To join two lengths of wire or flex, it is only necessary to twist the two ends together, wrap the joint with Multicore tape and apply a lighted match or the flame of a petrol lighter. The solder will melt and flow into the splice, forming a perfect fusion flame. For heavier work, of course, a spirit lamp or Bunsen burner is more efficient. Multicore solders are sold in reels or cartons, and are obtainable from all ironmongers and tool dealers.

READERS' LETTERS

● Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

GRAPHITE LUBRICATION

DEAR SIR,—We were most interested to read in your issue dated March 12th, 1953, a reference to the use of graphite in ball-bearings.

Your comments regarding the suitability of colloidal graphite were also appreciated. We would, however, like to make one or two further comments, which we hope you will find of interest.

While it is stated that in theory lubrication of ball- or roller-bearings is unnecessary, nevertheless, in practice, it is essential that a film of lubricant should be interposed between the rubbing surfaces which are present in every ball- and roller-bearing.

In the case of bearings containing a cage to separate the balls or rollers, sliding friction occurs between the rotating balls and the internal portion of the cage. If there was no sliding action, the balls or rollers would skid in the races.

When a grease containing " dag " colloidal graphite is used, the rubbing action mentioned above induces the formation of a graphoid surface, which minimises internal friction and prevents metal-to-metal contact.

Tests carried out by the National Physical Laboratory, and also by several manufacturers employing this type of bearing, have shown the benefits that are to be obtained by the introduction of " dag " colloidal graphite into the oil or grease, particularly when high loading conditions, or high temperatures, are unavoidable.

A series of tests were carried out on high speed precision tools used in the aircraft industry, which clearly showed the benefits that can be obtained. The main tests were carried out on small gearboxes utilising ball-bearings. These units normally run at a speed of between 10,000 and 15,000 r.p.m. The introduction of " dag " colloidal graphite into the lubricants normally employed, effected a 33 1/3 per cent. reduction in temperature and reduced both gear and ball and race wear to negligible proportions.

Yours faithfully,
ACHESON COLLOIDS LIMITED.
London. G. J. BENNINGTON DAVIES.

ROTARY VALVE ENGINES

DEAR SIR,—With reference to the query by J.H. of Bristol, I have in my possession a copy of the proceedings of The Institution of Automobile Engineers for 1935-36.

It contains a paper read by R. C. Cross, giving details of the difficulties encountered and the results obtained while developing a rotary valve for I.C. engines.

Several drawings are reproduced, together with information regarding the lubrication of the valves.

Should the above reader care to borrow this book I will be pleased to lend it to him for a week or two.

Yours faithfully,
Bolsover. CHAS. S. R. SMITH.

WIND-DRIVEN GENERATORS

DEAR SIR,—If any reader of THE MODEL ENGINEER has successfully tried out a wind-driven geared generator I for one would be happy if he would, with your permission, relate his experiences in a future issue. What I wish to achieve is to drive a heavy slow-running generator of 12 V and about 800 to 900 r.p.m. by means of a multi-varied propeller which, of course, cannot turn at the same high speed as the single propeller, and consequently calls for gearing. Having tried out several single propellers, I am somewhat sceptical at the high speeds said to be obtained by them—some, one to two thousand r.p.m.—and am forced to wonder whether the dynamos connected thereto are themselves geared.

Yours faithfully,
Bovingdon. GEO. W. JOLLIFFE.

"GROWING" OF DIE-CASTINGS

DEAR SIR,—Regarding the letter on Motor Car Repairs from " Interested " of Salop in a recent issue, I can confirm that the " growth " of certain die castings, to which he refers in paragraph 5, actually does take place. Just after the war, one of my colleagues who had laid up his car, and largely stripped it before so doing, came to me with an S.V. carburettor which he said would not re-assemble. On investigating the cause I found that the piston was some 0.004 in. (four thousandths of-an-inch) bigger than the cylinder bore. I had to re-turn the piston to enable the job to be assembled.

Whether the piston had " grown " or the cylinder had " grown " inwards, or a bit of each, I cannot say. There was no measurable lack of circularity in either piston or cylinder. I have come across this peculiar growth on one or two occasions with die castings, and I believe that it is due to a very slow change in the micro-structure of the alloy; it is, I know, a recognised trouble with certain zinc alloys.

Yours faithfully,
Rustington. K. N. HARRIS.

TRACTION ENGINES AT HULL DOCKS

DEAR SIR,—With regard to the last paragraph in a " Smoke Ring " on the above subject in the issue dated September 25th last, I have been waiting since last year to see Mrs. Rose Drakeley.

She called at my office on another matter recently, and I read the article to her. She confirms that the Foster No. 14634 was bought by her in 1936 and named *Princess Marina*. She still has this engine (with three others) and it has been retubed, but not used for three years, as she has gone over to diesel. It is runnable however, subject to a boiler inspection by the insurance company beforehand.

She tells me also that many people have looked these engines over since 1936, and she is always willing to let anyone see them.

Her address is : Mrs. R. Drakeley, Railway Wharf, Stechford, Birmingham.

Yours faithfully,
Birmingham. WILF. H. KESTERTON.

AMERICAN LOCOMOTIVE HISTORY

DEAR SIR,—In the February 26th issue of THE MODEL ENGINEER, A.M.B. of Bristol made enquiry for a book on the development of American locomotives.

The Steam Locomotive in America, by Alfred W. Bruce published by W. W. Norton & Co. Inc., New York City ($7.50), first edition 1952, covers the history and development of our engines from 1900-1950. It has photographs, diagrams and statistics.

Yours faithfully,
CARL W. CHASE,
New York, U.S.A.

PUNCHING LEAF SPRINGS

By W. R. Gosden

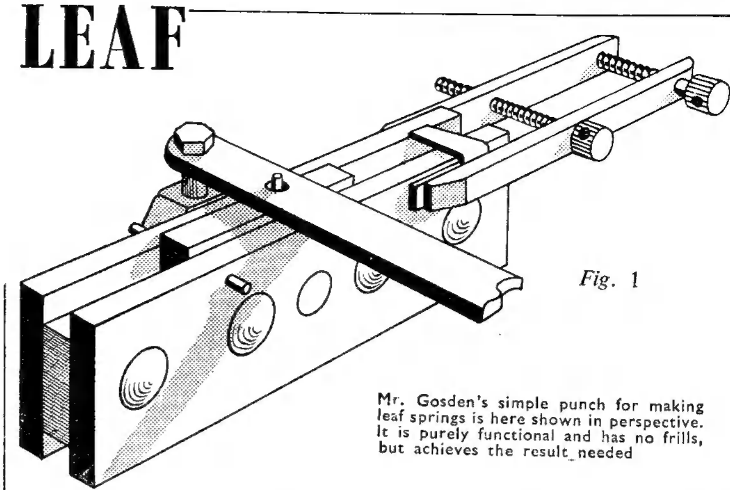


Fig. 1

Mr. Gosden's simple punch for making leaf springs is here shown in perspective. It is purely functional and has no frills, but achieves the result needed

I FOUND it necessary to make about 200 spring leaves for a $2\frac{1}{2}$-in. gauge Boston and Albany 4-6-6 tank locomotive I am building. These leaves have one thing in common—a width of $\frac{1}{4}$ in., but otherwise they vary considerably. Some have slotted holes at each end, some a round hole in the centre, and some a " dimple " in the centre. To achieve these various effects, I tried the time-honoured method of a hammer, a punch, and a block of lead, but I found it difficult to obtain the required degree of accuracy, and there was an alarming wastage through cracked leaves. I, therefore, decided that some form of punch and die must be made.

The time I can spend on my hobby is limited, and I begrudge time spent on making tools as against building a locomotive. It was obvious that something simple was called for—no frills—purely functional. The result of my meditations is shown in Fig. 1, and the drawings make the construction fairly clear.

Before describing the operation of the punch, I will explain how it was made. The sizes given are those I used—they can be used as a guide for a tool to suit the spring-steel you are using.

A piece of $\frac{7}{8}$ in. × $\frac{1}{4}$ in. bright mild-steel 4 in. long was sandwiched between two pieces of $1\frac{1}{4}$ in. × $\frac{3}{16}$ in., and four $\frac{1}{4}$-in. holes drilled right through. Iron rivets were inserted after removing the arris from both ends of each hole in each piece of metal, and were well hammered down. I used snap-head rivets, which form a useful stop against the top of the vice-jaws when the punch is in use. I might mention the $\frac{7}{8}$ in. × $\frac{1}{4}$ in. was actually 1-thou. oversize on the thickness, which gave me a nice sliding fit for the $\frac{1}{4}$ in. × 8-thou. spring-steel I was using for the leaves. If necessary, a piece of very thin foil—or even paper—could be sandwiched in to get the required freedom (Fig. 2).

Next, a hole was drilled and tapped $\frac{3}{8}$-in. B.S.F. through the centre of the " sandwich," and a $\frac{3}{8}$-in. B.S.F. bolt screwed in. The unthreaded part of the bolt was of such a length that, when tightly screwed in, the centre of the thickness of the bolt-head was about $1\frac{1}{8}$ in. from the centre of the groove in the " sandwich." Care was taken to have one flat on the bolt-head horizontal—that is, parallel with the edge of the block. In the centre of this flat was drilled and tapped a $\frac{1}{4}$-in. B.S.F. hole.

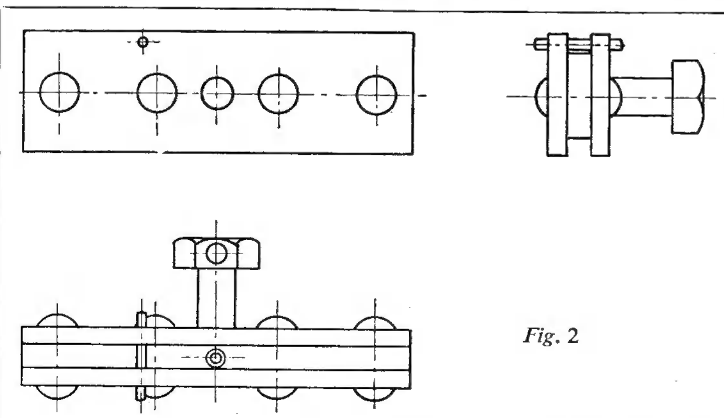


Fig. 2

The next job was to make the guide block (Fig. 3) from a piece of $\frac{1}{4}$ in. square mild-steel $1\frac{1}{4}$ in. long. This was lightly rubbed on a piece of emery cloth until it was a nice sliding fit in the groove. The centre of the length of the groove was marked, and the guide block clamped in the groove, with $\frac{3}{8}$ in. of its length to the right of this mark, the bolt already screwed in being at the far side of the block. A 3/32-in. hole was then drilled clean through at a position $\frac{3}{4}$ in. left of the centre mark, and 3/32 in. down from the edge of the sandwich. The guide block was removed, the 3/32-in. hole in it slotted down to the bottom of the block—taking care to keep the slot a good fit on a piece of 3/32-in. silver-steel, which was lightly driven into the hole in the sandwich. Replacing the guide block in the groove, with the slot engaging the pin, a $\frac{1}{8}$-in. hole was drilled right through the guide block and the centre layer of the sandwich, including the $\frac{3}{8}$-in. bolt. This hole is $\frac{3}{8}$ in. from the right-hand end of the guide block, and was marked and drilled with due caution, to ensure interchangeability of the " end product "—namely, the spring leaves. After removing the guide block, the $\frac{1}{8}$-in. hole in the sandwich —I think it is now sufficiently advanced to refer to it as " the bolster "—was enlarged to $\frac{3}{16}$ in. for $\frac{1}{4}$ in. depth, and bottomed with a D-bit.

All that then remained to be done—apart from making the dies

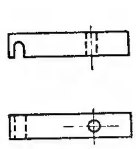


Fig. 3. Details of the guide block, made from square mild-steel

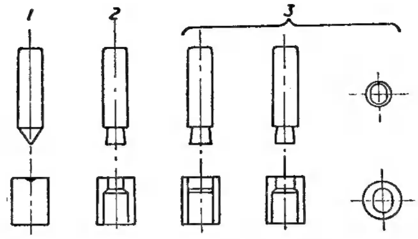


Fig. 4. (1) *Punch and die for " dimple "* ; (2) *Punch and die for round hole* ; (3) *Punch and die for slotted hole*

and punches—was to drill a 9/32-in. hole near the end of a 15 in. length of $\frac{3}{16}$-in. × $\frac{3}{4}$-in. flat steel, and another similar hole at $1\frac{1}{8}$ in. centres from the first. A $\frac{1}{4}$-in. B.S.F. bolt screws through the end hole into the head of the $\frac{3}{8}$-in. bolt. This lever is used to apply light pressure to the guide block whilst the punch is driven through the spring-steel.

Punches were made from $\frac{1}{8}$ in. round silver-steel, and the dies from $\frac{3}{16}$ in. round. They were held in split bushes for machining, to ensure a reasonable degree of accuracy. They have given no trouble in operation. Fig. 4 shows full size details of those I have made and used.

The dies are allowed to stand a few thou. proud of the groove in the bolster to make sure the spring-strip is rigidly supported.

The punch and die for making the slotted holes needed just a little extra care. First I drilled through the centre of the die 3/32 in.—the minor axis of the required slot—and enlarged to $\frac{1}{8}$ in. (the major axis) for 5/32 in. depth. With a rat-tail file, the 3/32-in. hole was slotted until the file touched the wall of the $\frac{1}{8}$-in. hole. A piece of 3/32 in. round silver-steel would then slide from end to end of the slot—all of 1/32 in. !—with no tight spots.

The punch, a piece of $\frac{1}{8}$-in. silver-steel, was held in a small split chuck, and about $\frac{1}{16}$ in. length turned down to 3/32 in. diameter. Careful work with a small flat file produced two flats about 5/32 in. long which just touched the 3/32 in. pip. The radius at the ends needed a little attention, after which the punch would enter the die freely, but without play. They were then hardened, after removing the pip.

I had intended to fit a pointer to this punch to ensure alignment with the die, but found it unnecessary, as the punch works fairly stiffly in the guide block, and shows no tendency to turn when in use.

The hardening was done by heating the punches and dies to a fairly bright red, and quenching in engine oil.

Having reached this stage, all was ready for a test. A die was inserted in the bolster, a length of $\frac{1}{4}$-in. × 0.008-in. spring-steel slipped into the groove, the guide block dropped on to it, the lever rested on the guide-block, the appropriate punch inserted in the guide block, slight pressure applied to the lever, and a sharp tap with a *very* light hammer given to the punch. This was where I decided I had made the thing almost *too* simple—it was necessary to pull the punch up with a pair of pliers after each " biff " ! In spite of this, the leaves I required were very quickly produced, I am quite satisfied with the accuracy—and I didn't have a single leaf split !

I found the simplest way was to punch all the holes (or dimples !) I wanted in a length of spring-steel, afterwards cutting to length with a pair of tin snips. Each group of leaves of a given length was clamped together and touched on the emery wheel, to ensure uniformity, and at the same time the corners were chamfered, where necessary.

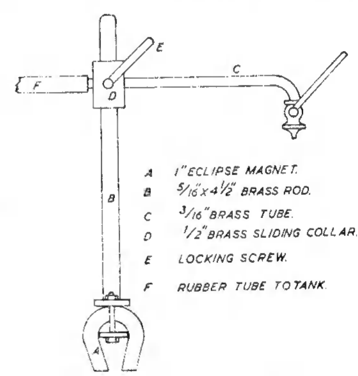
To obtain a degree of accuracy in spacing the holes in the strip, I cut a piece of aluminium sheet (almost any metal would do as well) in the shape of a letter L. The short end was bent at right-angles, so that when the long arm was clamped to the bolster with a toolmaker's clamp, the short arm provided a " sight " on the edge of a previously punched hole. Taking care to keep tolerances on length " plus," not " minus," it was a simple matter, after the punching was done, to cut off the first leaf, by measurement, and use it as a jig to cut the remainder.

A DRIP-FEED FOR CUTTING-LUBRICANT

AFTER much tribulation and mess with brushes and the disadvantage of having only two hands, I devised the following gadget. It consists of a small magnet (*A*) with a post (*B*) up and down which slides a collar (*D*) which can be locked in position by the screw (*E*). To this collar is sweated a length of brass tube (*C*) which is bent to a right-angle at one end and has a small bib-cock attached to it. The other end takes an india-rubber tube from the supply tank of " suds " or cutting oil. The upright post which is $\frac{5}{16}$ in. in diameter had a shoulder turned down at its base to $\frac{1}{8}$ in. and this was sweated into a brass plate, which, with another similar one to correspond, holds the post securely to the magnet by means of two $\frac{1}{8}$-in. bolts and nuts.

The arrangement works most satisfactorily, as the magnet is put on the top-slide of the lathe and can be moved about and fixed so that the drip from the bib-cock goes exactly on to the cutting face all the time, since the drip moves with the tool.

The suds tank is a quart oil tin (rectangular, of course) and is hung on the wall above the lathe.



A Terry spring clip is sweated to the top of the tank and provides an anchor for the whole gadget when not in use. The " keeper " should always be placed across the feet of the magnet when it is not in use, and it is well to give the tank a good shake up before getting to work. I am thinking of trying to fit a suds tray to fit to, and move with, the top-slide, but I am dubious as to whether it will be possible. The feed tube (*C*) should be as long as possible so that the upright post is clear of the work and out of the way. —MILES SARGENT.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

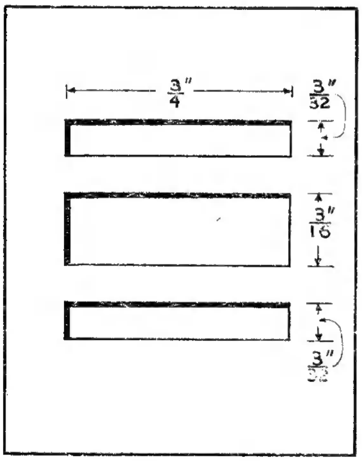
(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Steam Ports

I am building a model compound marine engine, H.P. cylinder, 1 in. bore; L.P. cylinder, 1¾ in. diameter, 1 in. stroke. Would you please advise me regarding sizes of steam and exhaust ports for same? I intend fitting a piston-valve to the H.P. cylinder and ordinary slide-valve to the L.P. cylinder

R.M. (Malden).

The high-pressure steam ports should be ½ in. by 3/32 in., and the exhaust ½ in. by 3/16 in. The low-pressure steam port, ¾ in. by 3/32 in.,



exhaust port, ¾ in. by 3/16 in. The measurement of the ports for a high-pressure cylinder would, of course, be the developed measurements, your intention being to use a piston-valve.

Painting the "Archibald Russell"

You were good enough some months ago to clear up one or two points in connection with the modelling of the "Archibald Russell."

I have now reached the painting stage and am finding difficulty in selecting what I feel is the correct shade of brown for the deck. I realise the mixing of colours is an intriguing business, but perhaps you can offer some suggestions, particularly in regard to the shade of brown in the Winsor and Newton range of oil colours. Are the masts painted, if so I assume they are the same colour as the deck?

R.G.C. Stock (Southampton).

The colour of the deck should be cream or very light brown. The deck would probably be made of pine, and would, as a rule, be scrubbed clean, and this, with the bleaching effect of the sun, would result in the colour given above. The masts and yards were usually painted yellow ochre. We understand that Messrs. Reeves are producing a new series of paints especially for ship modellers. In the pre-war series which they produced, they had a tint named "mast colour," and if you can get this it would suit your purpose admirably.

Cleaning Clockwork Mechanisms

In his book "Model Railway Clockwork Mechanisms," Mr. Ernest F. Carter recommends benzene or "lighter fuel" for the washing out of mechanisms.

The cost of the former is somewhat prohibitive and the latter pretty considerable (where any large quantity is involved) and it has been suggested to me that methylated spirit or white petrol would be equally pure for this purpose, and I would be glad of your advice on this subject.

J.P.B. (Hove).

We would say that methylated spirit is absolutely useless, because it will not mix with oil or oily deposits and simply evaporates, leaving everything untouched. Benzene, or "lighter fuel" is the best possible medium for the purpose of cleaning clockwork mechanisms; it removes every vestige of oil and dirt if the mechanism is thoroughly washed in it. A bottle of "lighter fuel," price 2s. 0d., should provide more than enough for your purpose. White petrol, however, is almost as effective. Take care not to use any of these petroleum fluids near any naked flame; the work of washing mechanisms is best done out-of-doors.

Blueing Mild-steel

Would you please advise me as to the best method of producing a good blue finish on mild-steel accessories?

E.A.S. (West Wickham).

The simplest way is by heating until the colours change, first to biscuit, then straw colour, then purple, dark blue and finally light blue.

To carry out this process, the metal must first be thoroughly cleaned, and all traces of oil or grease removed, preferably by means of scouring in an alkaline solution such as washing soda, and rinsing, then drying off with a clean rag.

The heat must be applied evenly, so that the temperature is even all over the specimen, which should be quenched out as soon as it arrives at the right colour. This is the method most commonly employed on tools and similar objects, but in cases where it is not practicable to heat the metal in this way, chemical colouring agents can be employed. A suitable chemical colouring is supplied by Precision Model Engineering Co. Ltd., Paradise Street, Liverpool.

Carburettor for Diesel Engine

I am constructing a 125 c.c. racing diesel engine. It is a two-stroke twin having crankshaft induction which I intend to use on a motor-cycle running on fuel as used in model diesel engines. Could you inform me what size of carburettor I shall require, and if there is one commercially available, and if not, has there been a design for one in THE MODEL ENGINEER*?*

D.R. (West Vale, nr. Halifax).

It should be possible to use any standard type of carburettor as used on lightweight motor-cycles for this engine, but it will probably need some alteration of the jet sizes.

The Amal or Villiers types of carburettors, as used on motor-cycles should be quite suitable, and are commercially available.

We have not published a design for a carburettor specifically to suit a 125 c.c. engine in THE MODEL ENGINEER, but such designs as the Atom Type R carburettor are quite capable of being enlarged to suit such an engine.